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Conservation versus survival: a cultural ecological study of changing settlement patterns, cultures, and land use in the Rio Platano Biosphere Reserve of northeast Honduras

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CONSERVATION VERSUS SURVIVAL: A CULTURAL ECOLOGICAL STUDY OF CHANGING SETTLEMENT PATTERNS, CULTURES, AND LAND USE IN THE RIO PLATANO BIOSPHERE RESERVE OF NORTHEAST HONDURAS

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ABSTRACT

Conserving ecologically valuable areas is proclaimed a priority by governments, institutions, and citizens throughout the world. Preventing the erosion of the remaining indigenous cultures also receives widespread support. In response to these desires, numerous protected areas now exist; spaces that theoretically should attain both ecological and cultural preservation. However, many of these areas are found within a larger setting plagued by ongoing struggles to meet basic needs. Often these larger problems create a challenge to, if not work in opposition to, the original aims of protected areas. This study of nine communities looks at these and related issues in the Río Plátano Biosphere Reserve of northeast Honduras. It focuses on frontier settlement, within a broader context of changing settlement patterns; on culture change and adaptation by the indigenous Miskito; on the new land use systems introduced by the new Ladino settlers; and on the overall implications for the integrity of the Río Plátano Biosphere Reserve.

CHAPTER ONE:

INTRODUCTION

Subsistence-based societies depend on their physical environment for survival. On a daily basis they collect water, gather fuel, and tend to crops and livestock. By manipulating their natural environment, they carve out their existence from the surrounding natural resources. These activities not only ensure that their basic needs are met, but also play a significant role in defining their cultural identity.

A major focus of this dissertation examines one of these societies, the Miskito of northeast Honduras, and how their subsistence-based cultural system is changing. The primary driver of change within the study area is new settlers, Ladino settlers, who are arriving and ekeing out a living in this traditionally indigenous region. These immigrants are being driven by poverty and unequal resource distribution characteristic of under-developed countries. The Ladino settlers are the actors who bring the national and international political and economic issues into the reality of the Miskito people, they link the local reality of the Moskitia to national and international issues.

This broader context has additional implications for the Miskito. The processes of modernization and globalization are accelerating. Culture traits from other societies once arrived like disconnected and sheltered droplets, but now they arrive in a steady stream. Almost everyday the peoples of the Moskitia are exposed to some artifact, behavior, or belief from the outside world. Residents are slowly adopting the traits of the global capitalist society, and for every adopted culture trait there are a dozen more they would like to adopt but are prohibited from doing so by their economic situation.

The recent emphasis on the conservation of forests, particularly tropical forests with their extensive biodiversity, has also touched the Moskitia. The study area lies within the first biosphere

reserve of Latin America, the Río Plátano Biosphere Reserve (RPBR). This also creates friction between the various scales of reality; the international community desires to conserve, the country needs to encourage socio-economic development, and the residents of the Moskitia want to improve their living standards.

The core of this dissertation, the intricate relationship between humans and their environment in subsistence based societies, has long been a subject of study for many scholars, especially anthropologists and geographers. These scholars have produced an extensive body of literature that describes various aspects of subsistence-based societies from every region of the globe. Traditional research typically focused on themes such as: how specific culture groups use their resources, adaptation to environmental change, the influence of environmental factors on decision making, and the knowledge of indigenous cultures.

More recently, there has been a shift across the sciences in the focus of dominant research themes toward the environment. Questions regarding the state of natural resources permeate research agendas in numerous disciplines. Themes such as the disappearance of carbon sinks, the loss of biodiversity, and the increasing sedimentation of waterways consistently appear in reasearch projects and journal articles while attracting funding from major research institutions. For cultural ecologists, the shift brings renewed importance and vitality to our research. Understanding how various culture groups utilize their natural resource base, especially in areas of environmental importance, are integral to dealing with these concerns. Once we understand the how and why of natural resource use, we will begin to understand what steps need to be taken in order to ensure approprate levels of environmental management and conservation.

This dissertation combines the traditional themes of cultural ecology with more contemporary environmental concerns. The research examines resource use and adaptation to both environmental and cultural change within a larger schematic of frontier colonization overriding the boundaries of a biosphere reserve.

Research Problem

The international boundary between Honduras and Nicaragua is superimposed on the landscape of the Moskitia (Map 1.1). This region, relatively untouched by modernization and development, is valued for its ecological and cultural treasures. There have been several efforts made at protecting these valuable environments, including the creation of protected areas. There are currently three such areas within the Honduran Moskitia and one in the Nicaraguan Moskitia which, together, create a corridor of protected areas. The northern-most of these is the Río Plátano Biosphere Reserve (RPBR). The RPBR was created in 1980, making it the first biosphere reserve established in Latin America (Map 1.2). This designation attracted attention and assistance from various corners of the globe, numerous organizations and governments wanting to contribute to the maintenance of the biological and cultural diversity of the region.

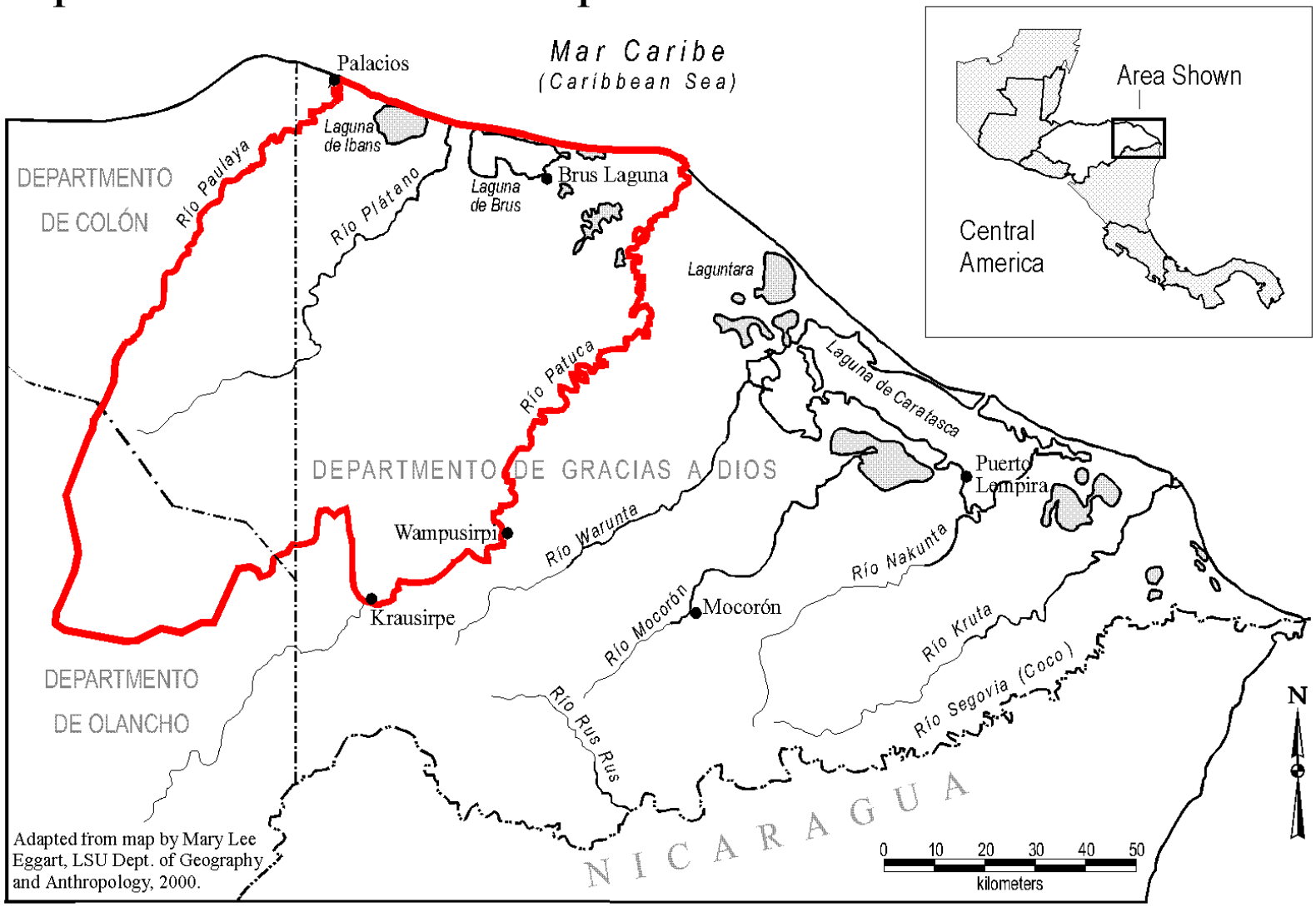
The ongoing efforts towards conservation and sustainable development are not successfully combating the various processes that devastate the valuable resource base. To the contrary, one of these processes, frontier settlement, intensified over the past 20 years. Ladino settlers have penetrated the boundaries of the RPBR on two separate points of the western boundary, one in the northwestern extreme and the other in the southwest corner (Map 1.3). Information on this process in the northwest region is scarce. No one has examined the settlement patterns and land use practices of the Ladino migrants, nor has anyone investigated the impact of this population on the local indigenous cultures. It is believed by many outsiders that the newcomers may be drastically altering land cover and therefore altering the land use practices of the indigenous culture, an integral part of the cultural identity of subsistence based culture groups.

This dissertation will focus on the northwest hub of Ladino settlement and the surrounding indigenous communities. The main objectives that guide my research are to:

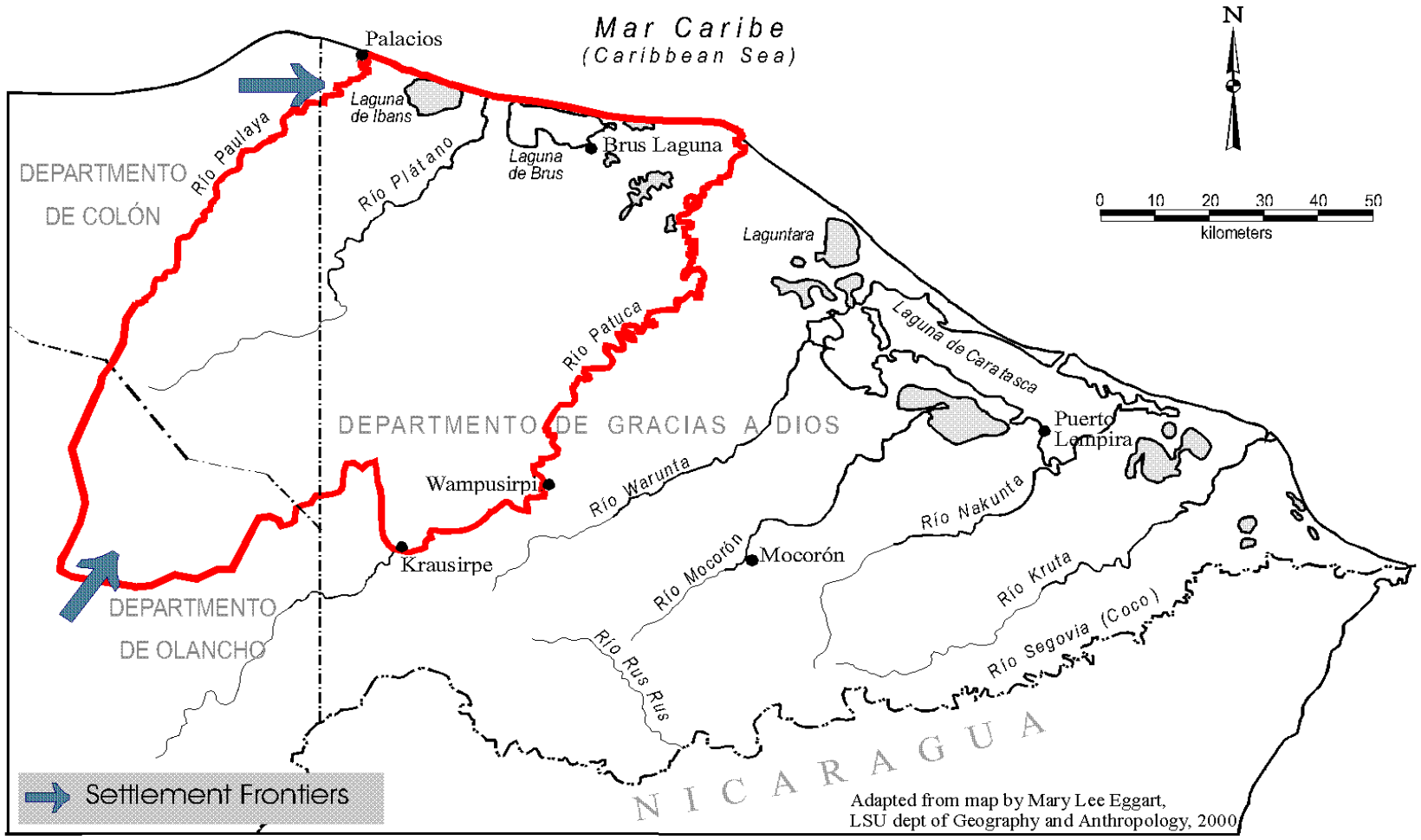
(1) document patterns of land use among the Ladino population


Map 1.1: The Moskito Coast
The Moskito Coast
Honduras
Caribbean Sea
Nicaragua
N
1 cm = 117 km

Map 1.2: Río Plátano Biosphere Reserve



Map 1.3 : Zones of Frontier Settlement in the RPBR



(2) demonstrate how and why land-use patterns are changing among the indigenous populations

(3) examine the impact of these changes on the indigenous cultural systems

(4) describe the impact of these changes on the local environments.

The Literature

This dissertation draws on literature from a variety of disciplines, all of which have a common theme -- the interactions between humans and their environment. Cultural ecology is notably the most influential discipline and provides the theoretical foundation of this study. The inextricable ties between cultural ecology, anthropology, and political ecology embed these related fields in the cultural-ecological structure of this dissertation. Other bodies of literature that contribute to the theoretical approach of this project concern protected areas, the idea of conservation through cultural survival, and land use and land cover change.

Cultural ecology is "the study of the relations between a culture group and its natural environment" (Johnston et al. 2000). The groundwork for this field was established by both anthropologists and geographers, such as Forde (1934), Netting (1977), Sahlins and Service (1960), Sauer (1925, 1952) and Steward (1955). Their work established a research tradition that is recognized by extensive fieldwork utilizing anthropological methodology in subsistence-based economies of non-Western societies. The key research themes established by these men continue to appear in contemporary studies. These themes include food production, the tools and techniques used to exploit the land, the role of culture in land use and adaptation, and the complexity of the relationship between people and nature (Brookfield 1980, Brookfield and Brown 1963, Butzer 1989, Denevan and Schwerin 1978, Knapp 1991, Turner and Brush 1987, Wilken 1987, Zimmerer 1996b, 1998).

Steward (1955), who was the first to use the term "cultural ecology", focused heavily on the role of adaptation. For Steward, adaptation is culturally specific and results in changes to the

cultural system. Over the past few decades this concept was molded and expanded to reflect the reality found in the field. Through this metamorphosis researchers came to focus attention on individual land-use techniques, decision-making, problem-solving, innovation and coping behaviors (Bennett 1969, 1976, Denevan 1983, Denevan and Schwerin 1978, Knapp 1984, 1991, Turner and Brush 1987, Wilken 1987). The importance of getting to this individual level was stressed by Denevan in 1983:

> "There are two levels of cultural ecological behavior, a cultural level, which is shared, and a level of individual strategies, which may or may not be widely shared. Variability is largely at the individual level, and change occurs first at this level, drawing upon innovation or diffusion" (400).

In focusing more heavily on the individual, researchers began to rely more heavily upon ethnographic methods, borrowed from anthropology, in their research methodology.

Cultural ecological studies began to elict criticisms from fellow geographers. The heavy focus on the individual-level and the tendency to examine human-environment relationships at a micro-scale often overlooked the impact of regional, national, and global level phenomena. The field of political ecology, the most recent of the man-land traditions, has begun to fill this gap by combining the cultural ecological approach with political economy. One of the first to discuss political ecology was anthropologist Eric Wolf who argued that comprehensive land use studies require the consideration of the interactions between the local people and larger scale political and economic forces (Wolf 1972, 204). Since 1972, various geographers and anthropologists have followed this approach and demonstrated how political and economic issues at larger scales impact the land use practices of small scale farmers and environmental quality (Bennett 1976, Blaikie 1985, Blaikie and Brookfiled 1987, Bryant and Bailey 1997, Grossman 1984, Hecht 1983, 1989, Hecht and Cockburn 1989, Knapp 1991, Netting 1977, Painter and Durham 1995, Peet and Watts 1996, Schmink and Wood 1984, 1987, Sheridan 1988, Smith and Reeves 1989, Steinberg 1998b, Stewart 1994, Stonich 1989, 1992, 1995, 2001,Watts 1983, Zimmerer 1996b, 1998). These and

other studies within the political ecology tradition have drawn on ecology to explain environmental impacts and political economy to describe how certain economic and political systems initiate and drive changes in land use practices (Zimmerer 1996a: 178). Some common themes addressed by political ecologists that are particularly relevent to this dissertation are are the roles of ethnicity and power (Bryant 1998, Zimmerer 1994), resource access and distribution (Peet and Watts 1996, Schmink and Wood 1984, 1987), and environmental consequences (Blaikie 1985, Blaikie and Brookfield 1987, Hecht 1983, 1989, Hecht and Cockburn 1989, Stonich 1989, 1992, 1995, 2001).

This dissertation focuses on the local level in its concentration on interactions with the environment and individual adaptations to increasing population and pressure on the natural resource base, which places this research in the realm of cultural ecology. However, it is embedded in a larger political-ecological framework which is imperative to understanding the local level processes.

Frontier Migration

Until the past few decades, studies in frontier migration focused on establishing a science of settlement, an understanding of how factors such as climate, infrastructure, soils, and ethnicity influence the process of settlement and the outcomes (Bowman 1931, James and Jones 1954, Joerg 1932, Pelzer 1945, Price 1939). These studies focused on both the settlement of North American territories (Bowman 1931, Joerg 1932) and on settlement in foreign territories (Joerg 1932, Price 1939, Pelzer 1945).

Frontier migration falls within the greater construct of rural-to-rural migration. Unfortunately, research on rural-to-rural migration has been spotty. In 1985, Brown and Lawson pointed out that migration research was preoccupied with rural-to-urban migration fields. Their research demonstrated that the destination of migrants is just as likely, if not more so, to be rural as urban. Although the rapid urbanization of third world cities over the past two decades may have changed the proportionality of rural to urban destinations, increasing concerns regarding

environmental degradation should underscore the importance of focusing on rural-to-rural migration patterns. Calls encouraging research on rural-to-rural migration are becoming more common (Carr 2001).

Over the past several decades, research on frontier migration has focused primarily on directed and semi-directed colonization (Agergaard 1999, Dominguez 1984, Eidt 1971, Findley 1988, MacLean 1984, Millikan 1992, Moran 1984, Oberai 1988, Smith 1976, 1982, Stearman 1983, Wood and Wilson 1984). Encouraging frontier settlement is seen as a cure to many ills faced by governments in developing countries: rapidly increasing population, scarce resources, insufficient food supply, and pressure to address unequal land distribution (Agergaard 1999, Conway and Shrestha 1981, Jones 1990, Oberai 1988, Pinchon 1996, Schmink and Wood 1984, 1987, Shrestha 1990, Uquillas 1984). As a result, it has been a popular approach in several countries. Research questions focus on numerous topics, such as: push and pull factors, who the migrants are, destination areas, permanence of settlement, socio-economic outcomes, ecological impacts, the capacity of the destination to absorb excess population, infrastructure, policy analysis, cost effectiveness, and long-term viability.

Spontaneous frontier migration is a third variation within frontier migration, but does not receive as much attention as directed and semi-directed (Brockett 2002, Brown et al. 1992, Brown and Lawson 1985, Pinchon 1996, Southgate 1990, Shrestha 1990). One major reason for this is the tendency for there to be an overlap between spontaneous, semi-directed, and directed colonization. These three processes are often inter-related and therefore need to be addressed collectively (Conway et al. 2000, Conway and Shrestha 1981, Henkel 1982, Jones 1990, Little 2001, Morgan 1988, Shrestha and Conway 1996, Uquillas 1984).

Two themes that re-appeared across several publications are highly relevent to this study. First, several authors focused on the battle between conservation and frontier settlement (Agergaard 1999, Brockett 2002, Conway et al. 2000, Hecht 1983, 1984, Little 2001, Lovejoy and Salati 1983,

Millikan 1992, Rudel et al. 2002, Sambrook et al. 1999, Shrestha and Conway 1996, Southgate 1990). The majority of these authors highlighted the degradation that often accompanies frontier settlement. However, two pointed out that it is possible to see some residents improve their land-use practices in the face of increasing population pressure on the natural resources (Conway et al. 2000, Rudel et al. 2002). Secondly, a few authors included the impact on local indigenous populations and their land-use practices (Conway et al. 2000, Ramos 1984, Rudel et al. 2002, Shrestha and Conway 1996, Wood 1983). Observations and reports tend to highlight the damage done to indigenous cultures and their loss of land. Again, some authors found the contrary, that recent adaptations in land-use practices were conserving both indigenous cultures and the natural envirnoment (Conway et al. 2000, Rudel et al. 2002).

It should be noted that the bulk of studies on frontier settlement in Latin America are focused on the Amazon Basin (Brown and Sierra 1994, Brown et al. 1992, Hecht 1995, 1983, 1975, Hecht and Cockburn 1989, Henkel 1982, Katzman 1977, Little 2001, Marquette 1998, Moran 1983, Pinchon 1996, Rudel et al. 2002, Shmink and Wood 1984, 1987). A few authors have addressed frontier settlement in the Moskitia. Samson (1997), looking at the migration fields within Honduras, found that unlike the typical migration fields in Honduras, which typically covers a shorter distance, migration to the Moskitia tends to pull people from a greater area. Herlihy and Leake (1992) discuss the colonization front of the southern Honduran Moskitia in relation to the Rio Patuca National Park, which borders the RPBR. Dodds' analysis of migration into and out of Gracias a Dios found that immigration currently exceeds emigration, with a net migration rate of +1.37 (1994).

Protected Areas

Growing international focus on conservation is propelling the expansion of protected areas. According to the United Nations Environment Programme (UNEP) and the World Conservation Monitoring Center (WCMC) there are now 30,350 protected areas, which cover a total of

13,232,275 km^2 (Protected Areas Database 1997). Several factors encourage the creation of protected areas, three reasons predominate:

- a heightened awareness at international levels of the need to conserve biodiversity
- the rapid deforestation of tropical forests
- a belief that protected areas will halt the destruction of forests and the loss of biodiversity (Brandon et al. 1998)

Biosphere reserves are unique in that they are nominated for biosphere status by states and designated as such by the man and the biosphere program (MAB), which is part of UNESCO (Furze et al. 1996). As of September 2001, 411 biosphere reserves existed in 94 countries. Sixty-three of these biosphere reserves are in Latin America, the RPBR being the only one in Honduras.

The MAB program originally grew out of concern for the preservation of ecosystems to ensure the availability of genetic resources. Over the years, several additional roles and responsibilities were given to these protected areas. As stated by article three of UNESCO's "Statutory Framework of the World Network of Biosphere Reserves" they are now expected to meet three mutually reinforcing functions:

(i) conservation - contribute to the conservation of landscapes, ecosystems, species and genetic variation;

(ii) development - foster economic and human development which is socio-culturally and ecologically sustainable;

(iii) logistic support - support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development (1996, 16).

In addition to these three functions, the maintenance of indigenous cultures is mentioned in several documents, although it is not as thoroughly incorporated into the framework as the three functions stated above.

Despite the number of protected areas and the effort put into national and international legislation which supports the maintenance of these areas, many obstacles remain. Some question the expanding list of responsibilities these parks are expected to bear, especially when they are contrary to one another (Brandon 1998, Dickinson and Putz 1990, Halfter 1994, O'Neill 1996, Utting 1994). The strongest critics claim that the parks just do not work (Dickinson and Putz 1990, Halfter 1994). Others stress that these protected areas in developing countries were created as a response to pressure exerted by the international community to conserve natural resources (O'Neill 1996, Utting 1994). In addition, these critics point out that these international conservation goals are contradictory to the expectations of developing countries, such as economic growth and less government involvement (Brandon 1998, Utting 1994, Sanderson and Bird 1998).

Other critics identify the lack of "on the ground" knowledge as a major concern. According to Halfter (1994), Zimmerer (2000), and Zimmerer and Young (1998), the creators and supporters of these areas typically lack familiarity with the local realities and therefore can not create effective management strategies. Furthermore, they can not incorporate the needs, priorities, and desires of the people (Herlihy 1990, Utting 1994, Zimmerer 2000, Zimmerer and Young 1998). The unawareness of the day-to-day reality and its absence from the planning process often contributes to the impotence of protected areas. For example, a few authors who are familiar with the local level reality point out that in inhabited protected areas, deforestation is often a rational response for the residents who are struggling to survive (Dickinson and Putz 1990, Schwartz 1995, Southgate 1990).

Among several factors of degradation in protected areas, some of the most common are logging, cattle ranching, and migration (Brandon 1998, Dugleby and Libby 1998). Migration is often the first step towards degradation by both increasing population pressure on natural resources and introducing new actors who are often responsible for ranching and logging. However, as previously stated, this pertinent, salient process of frontier migration does not receive an adequate amount of attention in the literature.

Protected areas are often structured around indigenous inhabitants. This approach is based on several related bodies of literature, including cultural ecology, that praise indigenous technical knowledge (ITK) and land-use practices for their conservationist nature. The logic behind structuring protected areas around indigenous populations is that indigenous people have coexisted with their environment for hundreds, if not thousands, of years. This "harmonious" coexistence is based on their ITK and land-use practices. Therefore, if they have guarded and maintained their resources for such an extensive amount of time, who better to take care of the environment than these well-established residents. However, numerous authors whose findings contradict these sentiments warn about blind faith in ITK (Bentley 1989, Denevan 1992, DeWalt 1994, Zimmerer 1996b). Denevan's 1992 article argued against the pristine myth, describing the landscape of the Americas in 1492 as heavily anthropogenic:

> "The myth that persists that in 1492 the Americas were a sparsely populated wilderness, 'a world of barely perceptible human disturbance'. There is substantial evidence, however, that the Native American landscape of the early sixteenth century was a humanized landscape almost everywhere" (369).

Other scholars are more moderate in their criticism and state that if outside threats are controlled, the indigenous will in fact be able to live in harmony with their environment (Herlihy and Leake 1992, Nietschmann 1984, Stevens 1997).

Land-Use and Land-Cover Change

In the early 1990's a research agenda was developed by the International Geosphere-Biosphere Programme (IGBP) and the International Human Dimensions Programme (IHDP). It has been termed Land-Use and Land-Cover Change (LUCC) and has been funded by the International Council for Science, the International Social Science Council, the National Science Foundation, the German Ministry for Science, Research and Technology, and the Netherlands. LUCC is an "interdisciplinary project designed to improve the understanding and projections of the dynamics of

land-use and land-cover change" (Nunes and Augé 1999:11). The main goals of this research agenda are to:

- expand the understanding of:
  - patterns of land-cover change
  - processes of land-use change
  - human responses to LUCC
- create integrated global and regional models
- develop databases on land surface, biophysical processes, and their drivers

Some of the main themes behind LUCC are also main themes within geography and cultural ecology. One of these is the emphasis on understanding the relationship between humans and their environment (Geist and Lambin 2001). LUCC recognizes that it is in fact the sum of local land-use practices and their resulting land-cover patterns that create the global environment, and that in order to thoroughly understand the global situation we need to begin by examining the basic building blocks, the local realities. Similar to political ecology, it emphasizes that what is occurring on a global level often trickles down to the local levels to create change, and the sum of these changes then reverberates back to the global level (Turner et al. 1995). The broadening recognition of scale, its complexity, and its role in the Earth's changing environment has brought it to the forefront of this international research agenda and gives a renewed importance to local and regional level cultural-ecological studies (McConnell and Moran 2001).

LUCC also mimics geography in its dedication to a multidisciplinary approach. It recognizes that a diverse array of variables are shaping LUCC and that a multidisicplinary approach is necessary to generate a holistic understanding of the issues involved. Contemporary studies in human-environment interactions can play a significant role in understanding the multiplicity of factors in regional and local level processes that are a part of this global-level environmental transformation.

Honduras and the Miskito[1]

There is a substantial body of literature on the Honduran Moskitia. Authors such as Bell (1862), Conzemius (1932), Dawson (1983), Floyd (1967), Naylor (1989), Squier (1858, 1870), von Hagen (1940), and Young (1842) give us historical accounts of the Moskitia, from the mid-1600s to the early 1900s. During the past few decades several scholars have begun addressing both the cultural and physical aspects of the Moskitia. Several geographers have written on the physical characteristics of the area (Arnold 1954, Clewell 1986, Denevan 1960, 1961, Johannessen 1959, Parsons 1955), and others on more cultural-historical aspects (Davidson 1976, 1980, Davidson and Cruz 1991, Helbig 1965, Parsons 1962). Perhaps the best known studies were from the Nicaraguan Moskitia by geographer Bernard Nietschmann, recognized for his substantial contribution which ranges from his cultural-ecological work to indigenous rights (1971, 1972, 1973, 1974, 1979a, 1979b, 1984, 1997) and anthropologist Mary Helms who focused on cultural adaptation (1967, 1969a, 1969b, 1971).

Since the declaration of the RPBR in 1980, a new body of literature on issues related to the biosphere has emerged (AFE-COHDEFOR 1996, Ashby 1977, del Cid 1998, Eilers 1985, Ferrera 2000, Froehlich and Schwerin 1983, Glick and Betancourt 1983, Greenquist and Boxer-Macomber 2000, Hering and Jaendl 1993, Houseal et al. 1985, MOPAWI 2000, 1999a,1995, Mancuso 1996, Murphy 1991, Pfeifer 1986, Romero 1992, Sanchez and Amaya 2000, Secretaria de Recursos Naturales 1995, Sletto 1999). Several planning and evaluation documents have also been published from within and outside Honduras (AFE-COHDEFOR 1996, 2001, AFE-COHDEFOR and BRP 1998, Caballero 2000, Cremer 1991, DIGERENARE and CATIE 1978, Fundación Río Plátano 1994, INA 1996, MOPAWI 1999a, 1999b, 1999c, SEDA 1996, TNC 1998, Wilber 1996)

[1] There are several variations on the spelling of Miskito. The Miskito language has only three vowels: a, i and u. Therefore, in the Miskito language Miskito is actually spelled Miskitu. the English are those that came up with the term of "The Mosquitia", which led to the incorporation of the qu and o. The two main variations that are found in the current literature are Mosquito and Miskito. I have chosen to use the latter due to its closer semblance to the Miskito language.

Several geographers and anthropologists have recently conducted research in the Honduran Moskitia. A few have completed primarily historical studies (Revels 2002, Tillman 1999), but most are contemporary themes on culture, the biosphere, and sustainability (Caicedo 1993, Dodds 1987, 1989, 1993, 1994, 1997, 1998a, 1998b, 2001, Godoy 1996, Godoy et al 1998, Herlihy 1990, 1997, 1999, Herlihy and Herlihy 1991, Herlihy and Leake 1997, 1992, McSweeny 2001, 2002a, 2002b, Samson 1997, Trenier 1999). Recent research conducted by geographer Mark Bonta (2001) in the nieghboring department of Olancho is not directly related to the research presented in this dissertation, but is noteworthy for its exceptional depiction of the complex on-the-ground reality. It examines the multiple geographic spaces and spatial identies, such as conservation space, state space, development space, local space, campesino space, and cattle space; and how the relationships between these spaces create the "entangled realities of everyday life" (2).

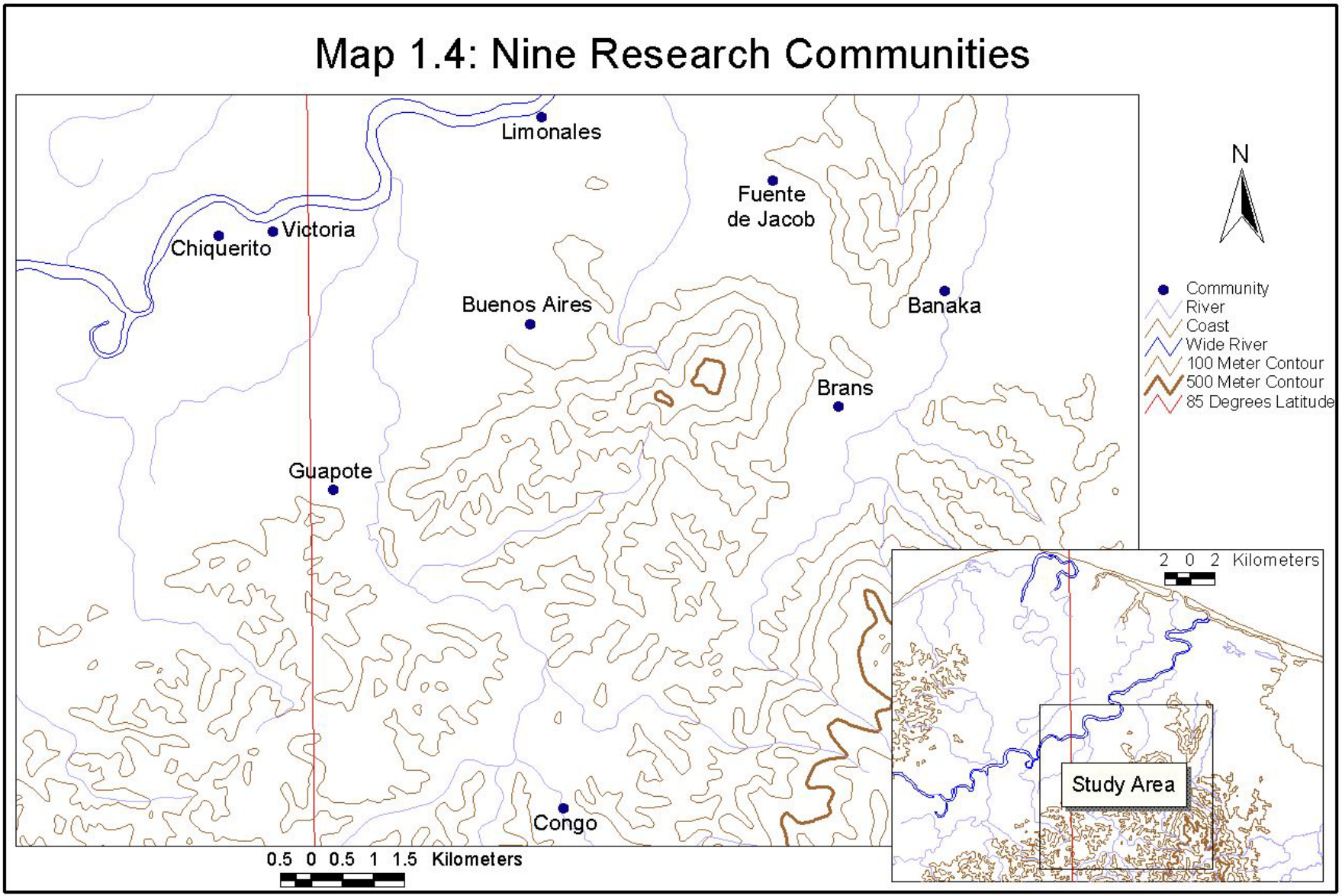
Methodology

The fieldwork for this dissertation was conducted during four trips, totaling ten months in Honduras, eight of which were spent in the Moskitia. The first trip, during the summer of 1999, was an initial visit to familiarize myself with the north-west region of the biosphere, to make contacts with various organizations, to see how the issues described in various publications existed in the local-level reality, and to select a study area.

Selection of study area

Nine villages and their adjacent settlements were selected for this study: Banaka, Brans, Buenos Aires, Chiquerito, Congo, Fuente de Jacob, Guapote, Limonales, and Victoria (See Map 1.4). The amount of territory occupied by these communities and their lands is approximately 53 square miles and straddles the settlement frontier that is encroaching on this area. The villages are ethnically diverse: six are occupied by Ladino settlers, two villages are Miskito, and one is mixed. Significant differences exist among the Ladino villages. For example, Guapote and Fuente de Jacob were recently settled by agricultural colonists, whereas Victoria was settled in the 1930s by

Map 1.4: Nine Research Communities



employees of the banana industry (which failed in that area shortly thereafter). Differences can also be found among the Miskito villages. Banaka, on the eastern edge of the study area, remains highly isolated and the eastward moving frontier has not yet passed through. As a result, there is an relative absence of modern influences and the area lacks the extensive clear cutting that accompanies the frontier. Whereas Limonales, which is surrounded by new Ladino settlers, is more accustomed to dealing with outside influences. This also applies to Chiquerito whose population is a mixture of Miskito and the long-term Ladino residents. The selection of such diverse communities will help to provide a broader picture of the factors that are influencing land-use change in this area. Limonales was chosen as a base community for four basic reasons: it is relatively large in comparison to the other communities, it is centrally located, is easily accessible because of its location on the river, and previous personal contacts there would facilitate the research process.

The research that followed occurred over two visits to the study area, the first was for 3 months during the fall of 2000 and the second was for 4 months during the late spring and early summer of 2001. All of the research was conducted in Spanish; I am fairly fluent in Spanish and the majority of Miskito speak Spanish. Initially, a greater proportion of the time was spent in the community of Limonales. As the study evolved, I began visiting the other communities. Each community was visited for four to ten days depending on the number and proximity of the houses as well as the availability of guides in these communities. In all of these communities, the same basic information was collected as in Limonales, however, in-depth information was not a possibility due to the lack of time. Table 1.1 shows the number of visits and days spent in each community. Multiple approaches were used to collect a variety of information that allowed me to address the objectives of the research. The methodological basis of this fieldwork mirrors other cultural ecological studies in its reliance on long periods of fieldwork in rural areas where múltiple approaches are utilized to collect data. Each of the following sections describes a research methodology that was used in the field.

Table 1.1 Fieldwork According to Community

Community	Number of Visits	Number of Days
Limonales	continuous	approx. 180
Fuente de Jacob	4	8
Banaka	1	4
Brans	1	1
Buenos Aires	1	1
Victoria	2	4
Chiquerito	2	4
Guapote	2	7
Congo	2	2
Total	15	211

Household Surveys

Household surveys designed to gather quanitative and qualitative information were initially designed after the preliminary stage of investigation, but were altered in the field as necessary. These surveys were conducted in all communities. Although they focused heavily on agriculture, they also sought information on population, education, migration, community involvement, food consumption, and economic activities. The survey has been reproduced in Appendix A. Visits were made to all occupied houses (where family members were present). Although it was not always possible, interviews with the male family head were most productive because men and older sons knew more about the agricultural practices of the family. Rarely did women know the size and production of the plots.

Surveys took from 20 minutes to 90 minutes, and normally lasted approximately 35 minutes. However, visits to each household were usually longer because of the need for the culturally required introduction and departure. Ninety-two percent of the households in the nine communities were interviewed (see Table 1.2). In some of the communities, it was not possible to interview all the households for three reasons: the short durations of fieldwork in those communities, extreme dispersion of the residences, and the difficulty of organizing return visits. These factors also

affected the ability to elicit all the information in the questionairre; to complete the entire questionnaire it was usually necessary that both household heads were present. If one was not present those questions remained blank. Because Limonales was my home base, more time was available for return visits, when necessary, to complete the surveys.

Table 1.2 Number and Type of Interviewees According to Community

Community	Households		Interviewee		
	Total number	Number interviewed	Head of Household	Family Member	Caretaker
Limonales	47	47	44		3
Fuente de Jacob	19	18	12	4	2
Banaka	39	31	25	5	1
Brans	10	10	9	1	
Buenos Aires	7	7	3	4	
Victoria	19	17	11	5	1
Chiquerito	9	7	3	3	1
Guapote	26	24	19	5	
Congo	1	1	1		
Total	177	162	127	27	8

Interviews: Life History of Elders

Ethnographical histories were collected as another way to understand changes that had occurred over the past three decades. The eight Miskito residents who had resided in Limonales for at least 40 years were considered for interviews. Five of these eight were interviewed. Of the three that were not interviewed, two did not speak Spanish and one was outside of Limonales the majority of the time.

Interviews were conducted during one or two sessions, with an average cumulative time of two hours. They took place in the resident's home, sometimes with the participation of other family members. Questions focused on their subsistence systems, material goods, education, modes of transport, and communication. A selection of subject areas and some specific questions are listed in Appendix B.

Semi-Structured Interviews with Key Informants

Semi-structured interviews were conducted with residents of Limonales and professionals who were associated with the area. These interviews were conducted to acquire more information on specific topics from residents who had extensive knowledge on certain themes in the area. For example, one resident who works with COHDEFOR (DQ) was interviewed about the extraction of wood from the biosphere and COHDEFOR 's activities. Interviews lasted from 15 to 40 minutes and were often executed while other activities, such as planting or traveling, were occurring. This allowed the interviewees to continue with their tasks and provided the interviewer with further opportunities to partake in participant observation.

Daily Activity Surveys

Within Limonales a daily activity survey was conducted to get a clearer understanding of how the population allocates its time in regards to agricultural and wage earning activities. This survey was conducted over eight randomly selected days in November 2000, and repeated over 16 randomly selected days in March-May of 2001. On these days all houses in Limonales were visited to determine what agricultural or other economic activity was being conducted by the household members. Questions garnered information mainly on the male residents who were no longer attending school. Females were often working in the home caring for children, cooking, and washing clothes. However, on occasion wives were helping husbands in the field or taking part in wage earning activities such as baking bread to be sold or washing clothes for other households.

Field Measurements

Twenty-two agricultural plots belonging to nine families from Limonales were measured to determine the accuracy of the reported land sizes. Ideally, all plots would be measured. However, traveling to plots and taking measurements is extremely time consuming and was therefore impossible to do for every plot owned or used by community members. The approach was simple, using a compass to measure direction and pacing for distance. The results were then drawn on

graph paper and the areas were calculated to compare the plot measurements to the reported sizes. The tendency to underestimate the areas of the smaller plots and overestimate the areas of the larger plots was consistent with the findings of Dodds 1997. A regression formula was calculated on the measured versus reported plot sizes in order to be able to correct the reported statistics, if so desired (Appendix C). In the interest of reporting primary data, the statistics throughout the majority of the dissertation reflect the reported areas. Only in the sixth chapter are the corrected numbers used (noted in the text) to create more accurate predictions for the long term implication of land-use and land-cover change.

Participant Observation

During the eight months spent in the RPBR, I was able to participate in numerous activities that deepened my understanding of the practices and processes that construct the reality of the people within the biosphere. Activites included all aspects of life, although there was an emphasis on agricultural activities. For example, I accompanied residents to their fields while they were clearing, planting, or harvesting on a regular basis.

Participation in non-agricultural activities were extremely enlightening. For example, town meetings held every Sunday would focus on concerns of the community as well as ongoing and upcoming projects, and possibly some police business. At one point several meetings were held because of conflicts in land tenure between ethnic groups. Other opportunities included witnessing political campaigns, the organization and implementation of development projects, and attending a regional meeting where land titling was discussed.

Archival Work

Archival work was conducted in Honduras to supplement the information gathered in the field. Topics of research included old census information, government policy, and the history of the Moskitia. Materials were found at USAID, MOPAWI, Universidad Nacional Autónoma de

Honduras, and La Oficina de Censo y Estadística. Maps and aerial photos were also in Honduras at the Instituto Geográfico Nacional.

In the United States supplementary information was supplied by Dr. William V. Davidson, Middleton Library at Louisiana State University, the Inter-Library Loan at Louisiana State University, Cornell University, and the Library of Congress.

Organization

Chapter two describes the setting of the research, including the physical and cultural geography of the Moskitia, significant historical aspects, the traditional land use system of the Miskito, relations between the Moskitia and Honduras, and the current issues that affect the study area. Chapters three through five discuss the results of the fieldwork in the biosphere. Chapter three identifies the three types of settlement change in the study area. Chapters four examines the land-use practices, among the Miskito villages, whereas chapter five examines the land use practices of the Ladino communities. Chapter six is a summary of the research and includes a comparative analysis of land use practices, the evolution of spatial patterns, land cover-change, and the implications for the RPBR.

CHAPTER TWO:

THE SETTING

Honduras occupies 112,088 square kilometers located approximately in the middle of the Central American isthmus. The physical geography is characterized by a mountainous interior, occupying approximately 80 percent of the country's area, and coastal lowlands. Of the approximately 6.7 million people inhabit the country, 46 percent of reside in the urban areas (Population Reference Bureau 2001). Fifty-three percent of the population lives below the poverty line in a country where less than 25 percent of the land is suitable for food production, the rate of natural population increase is 2.8 percent, only 29 percent of males and 37 percent of females are enrolled in secondary schools, and the per capita GNP is $760 (*ibid*).

These few statistics are not meant to portray a complete picture of Honduras. Rather, they are a starting point for reviewing a few critical issues; ones that are challenging the country, impacting the isolated region of the Moskitia, and are repeated in underdeveloped countries throughout the world.

Historically, Honduras, like other developing countries, has been dependent on the primary sector of their economy. Honduras relies heavily on the export of natural resources and agricultural products, making it vulnerable to boom and bust cycles. After WWII developmentally focused aid packages emphasized the role of agricultural exports, exacerbating problems with their reliance on the primary sector activities and the economic stratification of society.

The increasing stratification of society created what is often referred to as the "cycle of poverty". With the policy emphasis on agricultural exports good agricultural land became concentrated in the hands of a few farmers, increasing economic stratification and compelling smaller land owners to move to marginal lands. As population expanded and the economic differences intensified, a growing number people became dependent on increasingly marginal

environments, which are not able to provide a reliable or sustainable food source. This "cycle of poverty" manifests when poor people are forced to move to a more marginal environment, which will not only aggravate their poverty, but eventually lead to successive moves to more marginal environments when the current resource base is exhausted. The increasing land shortages coupled with widespread poverty push people to migrate to areas of opportunity, primarily the cities or open lands; one of the few areas with open lands in Honduras being the Moskitia.

Primary sector dependence continues today. Twenty-nine percent of the labor force is employed in agriculture, agricultural exports accounting for 16.2 percent of the gross domestic product. Table 2.1 lists the value of major exports that play a role in the changing landscape of Honduras. Note that two of these products, lobsters and wood, come out of the Moskitia. The emphasis on primary activities, increasing poverty and land shortages, and the availability of land and resources in the Moskitia all drive the frontier settlement occurring there.

Table 2.1: Values of Top Honduran Exports

Product	Millions of Dollars
coffee	429.8
bananas	175.7
shrimp	128.8
zinc	36.3
lobster	29.3
wood	16.4
sugar	10.2
tobacco	8.6
silver	7.8
beef	4.0
lead	3.2

Source: International Monetary Fund, 2000.

The Study Area

This study is rooted in the isolated northeast corner of Honduras, otherwise known as the Moskitia. The traditional inhabitants of the region are three indigenous groups: the Miskito, Pech, and Tahwaka. Their survival is based primarily on a subsistence economy, supplemented by marginal involvement in the capitalist economies that have reached the Moskito Coast. Both economies are dependent on the natural resources of the region.

Historically, immigration to the region was close to non-existant. The difficult environment and the distance from high-density population centers have discouraged colonization and settlement of the region, while at the same time retarding modernization and development. During the past few centuries a trickle of daring migrants, both foreigners and Hondurans, penetrated the Moskitia's natural barriers and left their mark on the landscape. Indigenous populations adapted to these alterations and life continued to evolve. During the past 20 to 30 years advances in technology and transportation has shortened the distance between the outside world and the Moskitia, overcoming the impediments of the physical environment. As a result, the trickle of migrants has accelerated into a steady flow, bringing with them artifacts of modernization that can be found on a daily basis.

Hundreds, if not thousands, of land-poor and landless *campesinos* have journeyed to the Moskitia, where they feel they can make a life for themselves and their families. This increase in population growth, combined with the natural rate of increase, and the resulting changes in land-use practices, raises questions regarding population pressure and the shrinking resource base.

A shrinking resource base is something that would not garner much concern several decades ago. However, over the past 20 years, an increasing awareness regarding the state of the environment has brought natural resources and biological diversity to the forefront of both national and international agendas. These agendas view the Moskitia as highly valuable, for both its natural and cultural resources. The increasing exploitation of the Moskitia's environment inspired the international community to make several attempts to protect the area. However, these efforts have

left a negligible imprint on the ground. The long-term residents parrot the rhetoric of why the RPBR is important and that it should be valued and protected. However, the actions of those same residents speak with a louder voice; their primary concerns are with survival as well as improving their standard of living.

Physical Geography

The Moskitia spans the east coasts of both Honduras and Nicaragua (refer to map 1.1). The Honduran Moskitia is a triangularly shaped region whose undefined boundaries extend slightly beyond those of the department of Gracias a Dios, which occupies 16,977 km^2 at the country's northeastern extreme. It is bounded by the Caribbean Sea to the north, the international border with Nicaragua, which follows the Río Coco, to the south, and the 85^{th} meridian to the west (refer to map 1.2). The Köppen Climate Classification system classifies this area as a Tropical Rainy (Af) climate. Annual precipitation varies between 2850 mm and 4000 mm, with daily accumulations throughout most of the year. The main exception is the main dry season, which occurs from February to May, and a shorter *verañillo* (short summer, a short dry season) occurring in September.[1] During these times a few consecutive days may pass without rain and daily precipitation totals will be below average. October, November, and December experience the most rainfall, averaging between 250 mm and 650 mm a month. The average annual temperature is 27 degrees Celsius, with the hottest month being April (28 degrees C) and the coolest in December (25 degrees C). The Honduran Moskitia, traversing 15 degrees north latitude, experiences the northeast trade winds for the majority of the year.

Topographically, the Moskitia is characterized by a gradual transformation from coastal lowlands (< 150 m), to low-lying plains (150 m -600 m), to forested highlands (>600m). These highlands, which run along a northeastern-southwestern axis, are the eastern fringes of the mountains that dominate the interior of Honduras. The underlying geology of the Moskitia repeats

the variation found in the topography. The highland areas are composed of old metamorphic rocks, such as slates, mica-schists, and quartzites, from the Paleozoic to Cenozoic periods. The coastal lowlands are "composed chiefly of Pliocene gravels and sandy clays of marine origin, …sloping gradually upward from the coast to the foothills" (West 1964:81).

A complex network of rivers and streams dissects the region. The main rivers from west to east are: Río Paulaya/Negro, Río Plátano, Río Patuca, Río Warunta, Río Mocorón, Río Nakunta, Río Kruta, and Río Coco (Segovia). Along these waterways and the coastal areas the soils are either alluvial or hydromorphic soils (Stevens 1964).[2] Miller has classified the soils along the low-lying plains as Tropic Fluvaquents, which are characterized by alluvial deposits with little profile development. The texture generally ranges from clay loam to silty clay loam, but lighter soils, such as very fine sandy loam, can also be found (1981:12). In the forested highlands the soils are classified as Typic Tropohumults with textures between silt loam to silty clay loam (Miller 1981). These soils are characterized by heavy leaching, low fertility, and shallow soil horizons (Stevens 1964).

The ecosystems that are found within the bounds of the biosphere are: estuaries and mangrove swamps, lacustrine ecosystems, savannah or coastal plains ecosystems, gallery forests, degraded secondary forest, and primary forests (DIGENERE and CATIE1978). The ecosystems and vegetation are associated with specific topographic realms within the biosphere. In the coastal area the vegetation is categorized as coastal herbaceous swamp and coccoloba coastal thicket (commonly known as sea grape). In the low-lying plains there is Pinus *caribaea* woodland and savannah with communities of sedge grassland savannah, inland herbaceous swamps, riverine forest, and seasonal swamp forests. The mountainous areas are dominated by tropical moist forests (Brunt 1981, Wagner 1964, Dinerstein et al 1995). The diversity within this area creates various

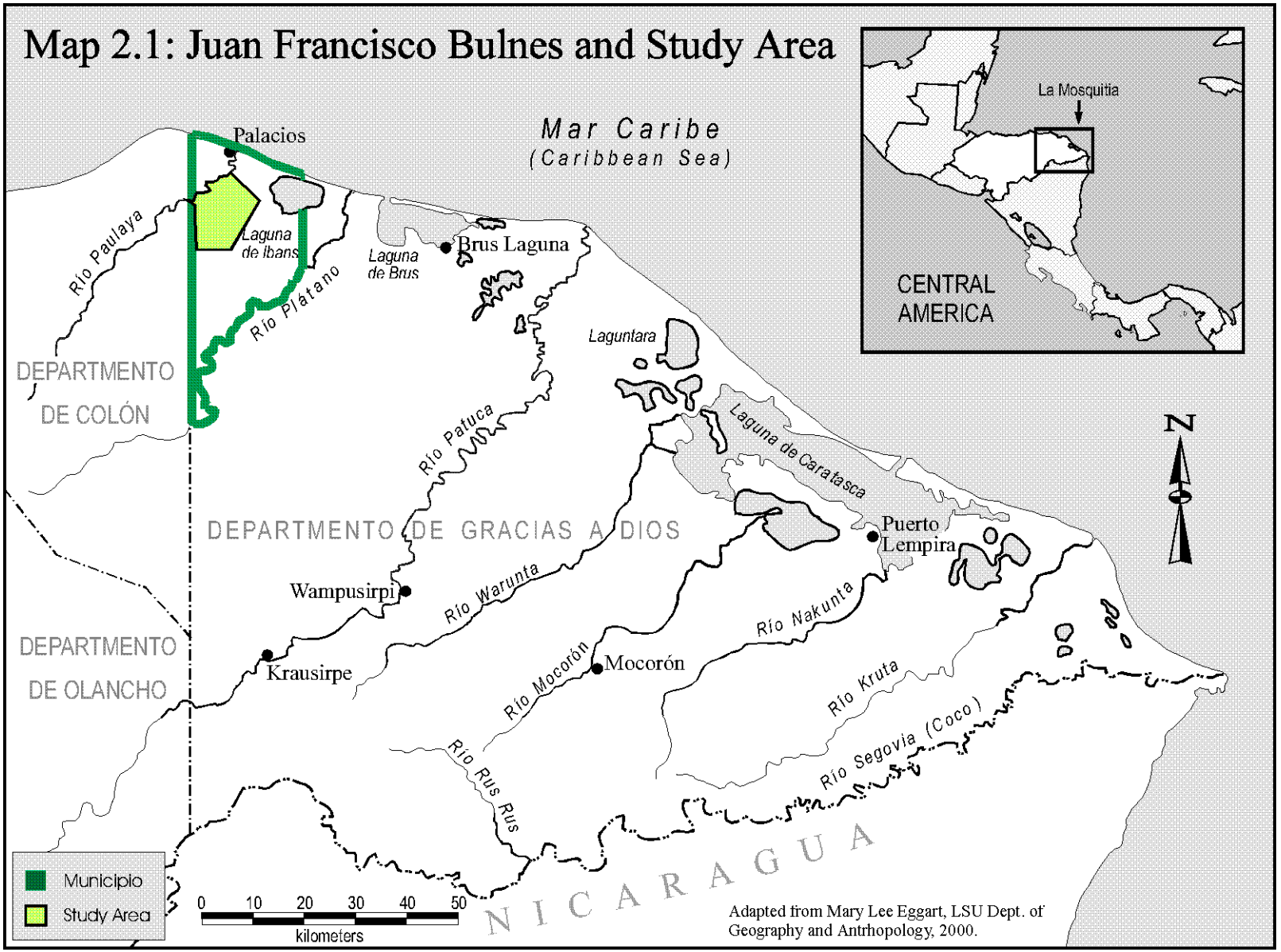
[1] These figures are estimations due to the fact that there are no points for meteorological data collection within the BRP.
[2] Hydromorphic soils are saturated with water which produces reduced conditions and affects plant growth.

habitats that support a wide array of plants and animals, which includes more than 14 threatened species (MOPAWI 1999a). The few studies that have been conducted on the fauna of the reserve have recorded 48 species of mammals, 377 species of birds, and 126 species of reptiles and amphibians.

The study area is found in the northwest corner of the department, within the newly created *municipio* of Juan Francisco Bulnes (Map 2.1). This area, approximately 735 km^2, reflects the environmental diversity of Gracias a Dios in that it contains all six ecosystems found within the department. The study area covers approximately 85 km^2 of the northwest corner of this *municipio*. The topography in the study area reflects the topographic transition between the low-lying plains and the forested highlands. The vegetation includes several valuable species, such as: mahogany, cedar, laurel, and Santa María. The main hydrographical feature in the study area is the Río Negro, which, at the southern edge of my study area, is formed by the union of the Ríos Paulaya and Sico.

Cultural Geography

The majority of the nearly 50,000 residents in Gracias a Dios reside along the coast and rivers. Within the RPBR are approximately 184 communities with a population of 41,082 (Herlihy 1997). These communities are inhabited by a variety of culture groups: Miskito, Pech, Garífuna, and Ladino. The Miskito and Pech have been in the Moskitia for hundreds of years, the Miskito currently accounting for the majority of the indigenous residents (Table 2.2). Although the Garífuna are numerous along the north coast of Honduras, there are only four Garífuna villages within the biosphere. According to Davidson (1983), this population's descendants are escaped slaves that arrived on St. Vincent island during the 17th century and then mixed with the local Arawak indigenous groups. Decades later, the British removed them to the Island of Roatan, from which they migrated to the Honduran and Belizean coasts. The Pech, who reside in five villages, are rapidly assimilating into the dominant Miskito culture.


Map 2.1: Juan Francisco Bulnes and Study Area
Mar Caribe
(Caribbean Sea)
Palacios
Laguna de Ibans
Río Paulaya
Río Plátano
Laguna de Brus
Brus Laguna
Laguntara
Laguna de Caratasca
Río Patuca
DEPARTMENTO DE COLÓN
DEPARTMENTO DE GRACIAS A DIOS
DEPARTMENTO DE OLANCHO
Wampusirpi
Río Warunta
Puerto Lempira
Río Nakunta
Krausirpe
Río Mocorón
Mocorón
Río Kruta
Río Rus Rus
Río Segovia (Coco)
NICARAGUA
La Mosquitia
CENTRAL AMERICA
N
Municipio
Study Area
0 10 20 30 40 50
kilometers
Adapted from Mary Lee Eggart, LSU Dept. of Geography and Antrhopology, 2000.

The Ladino population recently surpassed the Miskito population, the Miskito accounting for 44 percent of the population and the Ladino accounting for 52 percent of the population (Table 2.2). Throughout the last century, there were few significant waves of migrants arriving in the Moskitia. In the early 1900s the booming banana industry attracted many Ladino's from outside of the Moskitia. In conjunction with the banana industry came the Trujillo Railroad Company which laid rail lines that reached the town of Sico by the mid 1920s. After the bust in the 1930s, some of the men that came to work on these plantations decided to stay (Mack 1997). The most intense colonization has taken place over the last 15 years. Currently two colonization fronts encroach upon on the RPBR (refer to map 1.2). One is in the southwestern corner of the biosphere, the other is farther north along the western border. The northern frontier represents the migration flow that is arriving in the study area.

Table 2.2: Demographic Profile of the RPBR[3]

Ethnicity	Villages	Population
Garifuna	4	1033
Ladino	128	21,566
Miskito	47	17,874
Pech	5	479
Total	184	41,082

Socio-Economic Portrait

Gracias a Dios' rate of development has been slow. There are few roads, limiting the bulk of regional transportation to foot, boats, and horseback. Airplanes are available for transport, both inside Gracias a Dios and for those coming and going. However, the majority of the population

cannot easily afford the airfare. Electricity is available for the few who have money to buy generators, and communication, until recently, has been limited to short-wave radios. Over the past year or so, satellite phones have become available in a few of the major towns.

Sources of income are limited. Within the study area and adjacent coastal areas, most personal income is derived from (1) cattle and their products, (2) the lobster industry, (3) tending the land of the large land owners, and (4) the transport and sale of cocaine (this is a fairly new source of employment, but the amount of money involved is quickly attracting a work force). The most lucrative forms of employment are the cocaine trade and working with the lobster industry, but these sources of employment are limited to those who reside on the coast. The settlements upriver have different options. A handful of large landowners profit from selling cattle, cheese, or renting their land to other cattle owners. The cattle owners who rent land in the RPBR are often from the urban areas of Honduras, such as Tegucigalpa and San Pedro Sula. The majority of this inland population looks to these landowners as a source of employment. Daily wages are typically 50 Honduran Lempiras a day, which, in American dollars, is equal to $3.13.

Most villages have at least one small store; the size of the store and the number of stores appear to be directly related to the size of the community. Goods most often sold in the stores include: coffee, lard, sugar, soap, toothpaste and toothbrushes, salt, chicken boullion, matches, candles, flour, baking powder, chips, tomato paste, spaghetti, canned sardines, herbs and spices, batteries, toilet paper, cloth, thread, yeast, cereal, powdered milk, candy, medicines, creams, shampoos, a few clothing items, juice, soda, cookies, bread, and juice mixes such as Tang. The most frequently purchased items are coffee, sugar, lard, salt, matches, and candles.

[3] Statistics based on Herlihy 2001. It should be noted that these statistics mask many ambiguities. For example, ethnicity is not always mutually exclusive. Also, ethnic composition of villages is rarely 100percent of any group. It should also be noted that 130 residents were either unavailable or classified in other ethnic groups.

A small percentage of the residents have found ways to improve their economic situation. This tends to be easier for the coastal residents who reside where people, goods, and money circulate, and for the large landowner, who can sell surplus crops, milk, and cheese. One such example is a home in Palacios that recently acquired a satellite phone. The owners offer its use to the community as well as passing tourists and businessmen for a small fee. Another example would be five or six store and motel owners who have been able to purchase generators to produce electricity for their homes and businesses. The most luxurious accommodations I have observed in the Moskitia belonged to one of the alleged cocaine runners. His house was newly built out of cement, with several rooms, tile floors, kitchen cabinets (like those in the US), a metal and glass dining table, television, videocassette recorder, stereo, several beds and mattresses, sofa and chairs, electricity (via generator), and a satellite dish. Some of the poorer communities, without these types of opportunities, receive assistance for outside sources. For example, the town of Limonales received help from the German government to construct a water system that brings a water pipe to residences.

Within the study area people have few opportunities to partake in the capitalist economy and improve their standard of living. Within this cluster of nine communities are one poorly equipped health center and three elementary schools. The schools are poorly staffed, one having a teacher for 110 students and another having three for 120 students. Classes are often cancelled because of illness, hangovers, and meetings. After sixth grade if the children would like to continue their education they move to the coast. Just about every community has at least one church, the majority of people belonging to the old Moravian, Reformed Moravian, or other Protestant churches. Table 2.3 provides an overview of the "amenities" available in each community. However, a better way to portray the socio-economic status of these communities is through photos. Pages 36-41 contain images from the communities.

Table 2.3: Community Profiles

	Limonales	Banaka	Chiquerito	Victoria	Fuente de Jacob	Brans	Buenos Aires	Guapote	Congo
Date Founded	1890	1930	1941	1930	1984	1997	1993	1983	1999
Dispersed/ Nucleated	nucleated	nucleated	nucleated	nucleated	dispersed	dispersed	nucleated	dispersed	dispersed
Ethnicity	Miskito	Miskito	Mixed	Ladino	Ladino	Ladino	Ladino	Ladino	Ladino
Pop	302	204	49	99	69	47	42	134	4
# of residences	47	39	9	19	19	10	7	26	1
settlements	4	2	No	No	No	No	No	No	No
School	Yes	Yes	Yes	Yes	No	No	No	No	No
Sch.Founded	1972	1993	unknown	2002	NA	NA	NA	NA	NA
# of teachers	3	1	1	1	NA	NA	NA	NA	NA
# of students	102	108	33 (8)	(25)	NA	NA	NA	NA	NA
# of churches	3	2	1	2	0	1	1	2	0
1st church	1977	unknown	1998	1999	NA	2001	2001	1998	NA
Stores	3	2	1	2	No	No	No	1	No
1st store estab.	1983	unkown	unknown	unknown	NA	NA	NA	1999	NA
Medical Center	Yes	No	No	No	No	No	No	No	No
when estab	1981	NA	NA	NA	NA	NA	NA	NA	NA
Latrines	Yes	No	No	No	No	No	No	No	No
When	1998	2001	NA	NA	NA	NA	NA	NA	NA
Potable Water	Yes	No	No	No	No	No	No	No	No
When	1998	NA	NA	NA	NA	NA	NA	NA	NA

Data based on fieldwork.

Figure 2.1: Miskito Home: Main House (background) and kitchen (foreground) in Bum, a settlement of Limonales. Miskito dwellings are traditionally built above ground, with kitchens separated from the main house.

Figure 2.2: Ladino Home: Kitchen (in center) and house (off to the right) in Fuente de Jacob. Ladino homes are traditionally built on the ground and more likely to be constructed with lumber.

Figure 2.3: Fuente De Jacob: Ladino communities tend to be more expansive, have less vegetation, and have no nucleated center.

Figure 2.4: Village of Limonales: proximity of homes and vegetation ids typical of Miskito settlements.

Figure 2.5: Boat Construction: a resident of Limonales constructing a *cayuco* from a single tree trunk. As natural resources have become scarce it has been difficult to find trees that are suitable for watercraft.

Figure 2.6: Center of Limonales: School in forefront, police post behind it, with abandoned forestry office on the slope to the back left.

Figure 2.7: Water Access in Limonales: a potable water project has brought water to many homes in Limonales.

Figure 2.8: Water Access in Victoria: a Ladino woman washing clothes. Access to water in the rest of the communities is limited to nearby rivers and streams.

Figure 2.9: Bathing: Lagoons, streams, and rivers also serve for bathing.

Figure 2.10: Stove Construction: a Miskito woman in Limonales is pounding clay-laden soil onto a wooden frame, the beginning stages of a new stove.

Land Use

Land-use practices evolve constantly, and what was typical 20 years ago is normally not typical today. Therefore, it should be understood that any description of land use reflects a snapshot in time. The following description of Miskito land use reflects the practices that were used during the 1960s-70s. The reasons for focusing on this era are twofold: there are detailed descriptions of Miskito land use available from this time period[4] and it reflects land use before two important events, the modern era of frontier settlement and the declaration of the RPBR.

The basis of Miskito survival is their subsistence economy. The main activities are swidden-fallow agroforestry, hunting, fishing, and gathering. Over the years Miskito have had several opportunities to become active in cash-earning activities, such as collecting chicle, extracting lumber, bananas, turtles, gold, and now lobsters. However, these ventures have proved lacking in longevity, exposing the Miskito to the "boom and bust" cycles of foreign economies. These short-lived injections of cash to the Miskito community has created what Helms (1967) has referred to as a purchase society; although not dependent on cash earning for survival, the Miskito have developed a preference for wage labor and the goods that can be purchased with these earnings. During the bust periods the Miskito have sufficient means for survival, but are characterized by what Helms describes as an ethic of poverty:

> "Depression means drastic curtailment in buying flour, sugar, salt, soap. It means fewer new clothes. It does not mean that the people of Asang are actually starving, or in the eyes of the observer drastically badly off. Due to the continuation of the subsistence economy, most people have adequate, even fairly balanced diets, manage to keep clothed, and have adequate shelter. However, they have acquired an ethic of poverty. The foreign objects and luxury foods obtainable through participation in the market economy are no longer available. Hence life is not completely satisfying. A feeling of want and of isolation has become dominant" (1967: 235).

[4] These studies were conducted in Nicaragua. Life histories collected in the study area have corroborated these accounts.

Literally living with or without is a primary source of the ethic of poverty in any society. However, the stark boom-and-bust cycles make this ethic more blatant in Miskito societies than in some others.

The typical settlement and subsistence land-use patterns of the Miskito are spatially divided between two different environments; coastal and inland. The communities and permanent homes are typically found along the coast and rivers while the more subsistence-oriented activities (agriculture, hunting, harvesting wood for making boats, and the collection of some medicinal plants) transpire inland along the rivers and smaller waterways. The only subsistence activity that takes place in the community is the cultivation of dooryard gardens. These gardens typically include fruit trees and herbs, but are not significant sources of caloric intake (Helms 1967).

The dietary staples were primarily cassava, several varieties of bananas and plantains, cocoyam, and taro root. Beans and rice played a less significant role. Nietschmann (1973) does not discuss beans as a major crop, although he does list it as one of the local cultivars. He mentions rice, but only as a cash crop. Helms (1971) mentions all of the above crops, but comments on the fact that according to the Miskito, rice and beans are planted solely for earning cash despite the fact that they consumed approximately half of the rice and beans that were harvested. Additional crops include sugarcane, watermelon, pineapple, cacao, corn, and various fruit trees.

As can be seen in Figure 2.11, the agricultural calendars provided by Nietschmann and Helms are similar, but have some significant differences. The first difference, which was previously mentioned, is the absence of beans in Nietschmann's account. A second difference is the presence of cocoyam and taro root in Nietschmann's schedule, but not in Helms'. Although she discussed these crops, they were not given a high enough priority to be included as staples. A third difference is the timing of the rice harvest. In Tasbapauni, rice is harvested much later than in Asang. The final difference in the two calendars is the small bean plantation (September) mentioned in Helms' calendar, which is absent from Nietschmann's. Both authors discussed *wis*

	Helms	Nietschmann	
		subsistence crops	rice - cash crop
Jan.	plant beans	cut underbrush and dense forest	
Feb.	weed beans	cut secondary forest	burn if swamp area
March	harvest beans, cut/burn other plots	burn	cut and burn
April	plant rice, corn, tubers, banana varieties	burn, plant	cut, burn, plant
May		finish planting	plant
June	weed rice	weed	weed
July		weed	weed
Aug.		weed	weed, begin harvest of 4 month rice
Sept.	harvest rice	harvest taro root	harvest 5 month rice
Oct.		harvest taro root, manioc	harvest 5 month rice
Nov.		harvest	harvest 6 month rice
Dec.		harvest	

Figure 2.11: Agricultural Calendars as Reported by Nietschmann and Helms5

plantations, smaller plots that serve as a supplemental source of food for seasonal shortages, which are typically planted in September or October. However, both authors stated that this practice was becoming rare.

Labor can be examined in three ways, according to (1) sexual divisions, (2) *pana-pana*, and (3) wage labor. Clearing is done by the men with ax and machete, then, when necessary, burned approximately four weeks later.[6] Both men and women traditionally work with planting, harvesting, and transporting, but this responsibility tends to fall more heavily on the women. Weeding is the sole responsibility of women and requires the use of machetes. Planting and harvesting often utilizes *pana-pana*, but, as noted by Nietschmann, only when planting subsistence crops.

> "The Miskito believe that if a man is going to make money from agriculture he should have to pay for labor. If on the other hand, a man cultivates primarily for subsistence, he will receive help from fellow villagers, for a man must eat and all must help" (1973:133).

5 Nietschmann 1972; 133 and Helms 1967; 238.
[6] Plot preparation differs according to crop. Rice, corn and cassava require burned fields, whereas beans do not.

Both Helms and Nietschmann cite "average" plot sizes for the Miskito. However, it is difficult to compare them for two reasons. First, they have different definitions of measurements. *Tas* (the equivalent of *tarea* in Honduras, which is equal to an area of 50 yards by 50 yards or 22,500 square feet), which is the measurement term used in both cases, represents an area of 50 yards by 50 yards for Nietschmann and an area of 50 meters by 50 meters for Helms, which results in a difference of 4396 square feet or 408.4 square meters. The items being measured also differs. Where Nietschmann measures subsistence vs. market crops, Helms measures each individual crop. The third problem is that the word "average" is defined differently for each scholar. Nietschmann's average applies to a family of 6-7 people, whereas Helms' average applies to the average family size in her study area. Since Helms' measurements are the overall average and are according to crop type, I will use her statistics for comparisons. The average family in Asang plants 1-2 *tareas* in cassava, 1-2 *tareas* in maize, ½-1 *tarea* in rice, 1-2 *tareas* in beans, and up to 4 *tareas* in bananas and plantains.

After one to two years under cultivation plots are generally left to fallow for anywhere from 1-10 years. To clearly demarcate these plots as being "used" even though in fallow, owners will typically plant longer term crops and fruit trees on the land. This is important because if not being "used" rights to the property may be challenged. Nietschmann notes that land is not generally sold, although a few people have sold plots that are considered beyond acceptable distances for subsistence plots (more than six miles from the village).

Hunting and fishing have been important sources of protein for the Miskito, even though they only provide between five and ten percent of the calories consumed (Nietschmann 1972: 53). Location plays an important role in the significance of these two sources. For example, in Tasbapauni on the Nicaraguan coast of the 160 men sampled by Nietschmann, 124 did some hunting or fishing, but when broken down only 35 percent of these men hunted, whereas 85 percent of them fished. In Asang, along the Río Coco, fishing was a more prominent activity in the dry

season when the rivers were low. Hunting only took place on weekends, and was more of something for relaxation than an activity they depended on to meet subsistence needs. When the men in these villages did hunt, they preferred swamps and new or old plantations, because that was where they were more likely to find animals. Common sources of protein included green turtle, hicatee turtle, hawksbill turtles, white-lipped peccary, collared peccary, fish, white-tail deer, shrimp, brockett deer, iguana, manatee, tapir, paca, agouti, monkeys, armadillo, birds, shellfish, and coati.

Animal husbandry played a minor role in these communities. Families typically owned a small number of pigs and chickens but meat consumption was often limited to periods of food shortages and special occasions. In Asang, wild game was preferred to domesticated animals. Therefore, it was more likely that the domestic animals would be sold than eaten.

Gathering does not play a significant role in caloric consumption. Eggs, seeds, and fruits are gathered during other activities, but people rarely go specifically to gather these items. When they are found, they are typically used as snacks between meals. Gathering is more important for the collection of barks, leaves, and roots used for medicinal purposes.

Despite this population's intense dependence on the natural resource base, the subsistence system of the Miskito remained relatively sustainable. Until twenty-five years ago, this area, part of the largest contiguous stance of tropical rain forest in Central America, experienced negligible amounts of deforestation. However, with a rapidly expanding population due to both natural increase and migration and increasing connectedness to a global capitalistic culture and its many material goods, the sustainability of the system plummeted. As of 1990, 25 percent of the area had been deforested (Herlihy 1997: 124).

The Biosphere: Goals and History

International pressure and rapid deforestation at a global scale prompted the creation of several protected areas within Central America. When the Río Plátano Biosphere Reserve (RPBR) was just an idea, the ecological integrity of the area was relatively in tact. However, it was in midst

of the initial deforestation that the RPBR was established. Currently, deforestation as well as the accompanying losses in biodiversity, habitats, and species are at dangerous levels (Glick and Betancourt 1983, Herlihy and Leake 1992, Wilber 1996).

The Río Plátano Biosphere Reserve, created in July 1980, was the first biosphere reserve in Latin America. It occupies an area of 8,150 km^2 within the Honduran Moskitia. Its boundaries are demarcated by the Caribbean Sea and several rivers: the Patuca to the east, the Wampú and the Dapawas to the south, and the Negro and Paulaya to the west. The aim of declaration and demarcation is to:

> "conserve for present and future use the diversity and integrity of biotic communities of plants and animals within natural ecosystems, and to safeguard the genetic diversity of species on which their continuing evolution depends. These are internationally designated sites managed for research, monitoring, training, and education. In most cases the human component is vital to the functioning of the reserve" (World Conservation Monitoring Center 1992).

In 1982 this same area was designated a World Heritage Site. The purpose of this designation is to "protect the natural features for which the area is considered to be of outstanding universal significance. This is a select list of the world's unique natural and cultural sites nominated by countries that are party to the World Heritage Convention" (World Conservation Monitoring Center 1992). These declarations, which were meant to protect the cultural and biological diversity of this area, did not encourage any significant action towards preservation, conservation, or management in the RPBR. Therefore, as greater numbers of people arrived in the RPBR, the degradation of the natural resources accelerated. As a result, in 1996 the Río Plátano Biosphere Reserve was placed on the list of World Heritage Sites in Danger.

The RPBR has continued to encounter many outside influences that have altered the land use patterns and cultural practices that have sustained both biodiversity and cultures over the past few centuries. Some influences are viewed as beneficial, such as the involvement of non-governmental organizations (NGO) like The Nature Conservancy and World Neighbors, which are

both conservation and development oriented. However, on the ground within the biosphere, these actors are hard to find. The only NGO that is recognized by the inhabitants is *Miskito Pawisa* (miskito development), commonly referred to as MOPAWI. This NGO's mission is to support and enhance the well-being of the Miskito. MOPAWI's current involvement in these communities is on two levels. At the local level they are working with some farmers in an attempt to improve agriculture and livestock. At the regional level, they are working to secure the land rights of the indigenous peoples in the RPBR. Unfortunately, this NGO is experiencing the typical problems faced by most NGO's; understaffed, overworked, communication problems between the NGO and the communities, infrequent community visits (due to understaffing), and communities that have learned to look for handouts.[7] In reality these organizations have goals and objectives that could be beneficial, but achieving these goals has proved difficult.

The majority of the outside influences are viewed as negative. These include agricultural colonization, cattle ranching, and logging. The long-term effects of other factors, such as the RPBR's management plan and independent agricultural projects, have yet to be determined.

Conclusion

This chapter has provided information on the local, regional, national, and international scenarios, within which the people and environment of the study area exist. This background information provides the foundation for the fieldwork that is discussed in the following chapters. The study area is a part of the global whole. It is a part of the Río Plátano Biosphere Reserve, which is touted by the international and national communities as a place that we are protecting for tomorrow. The study area is also a microcosm of the socio-economic struggles that are occurring throughout Honduras and the globe. It is a struggle that comes down to choices between short-term

[7] Many residents expect material assistance from both national and international NGO's. For example, after hurricane Mitch one resident was excited that this hurricane was bigger than Fifi; he had anticipated a generous amount of handouts which would improve his economic situation (M.P., interview, March 2001).

and long-term well being, sacrificing the quality of the natural resource base to meet today's needs. In being a part of these patterns, the study area is representative of and connected to the global community.

CHAPTER THREE:

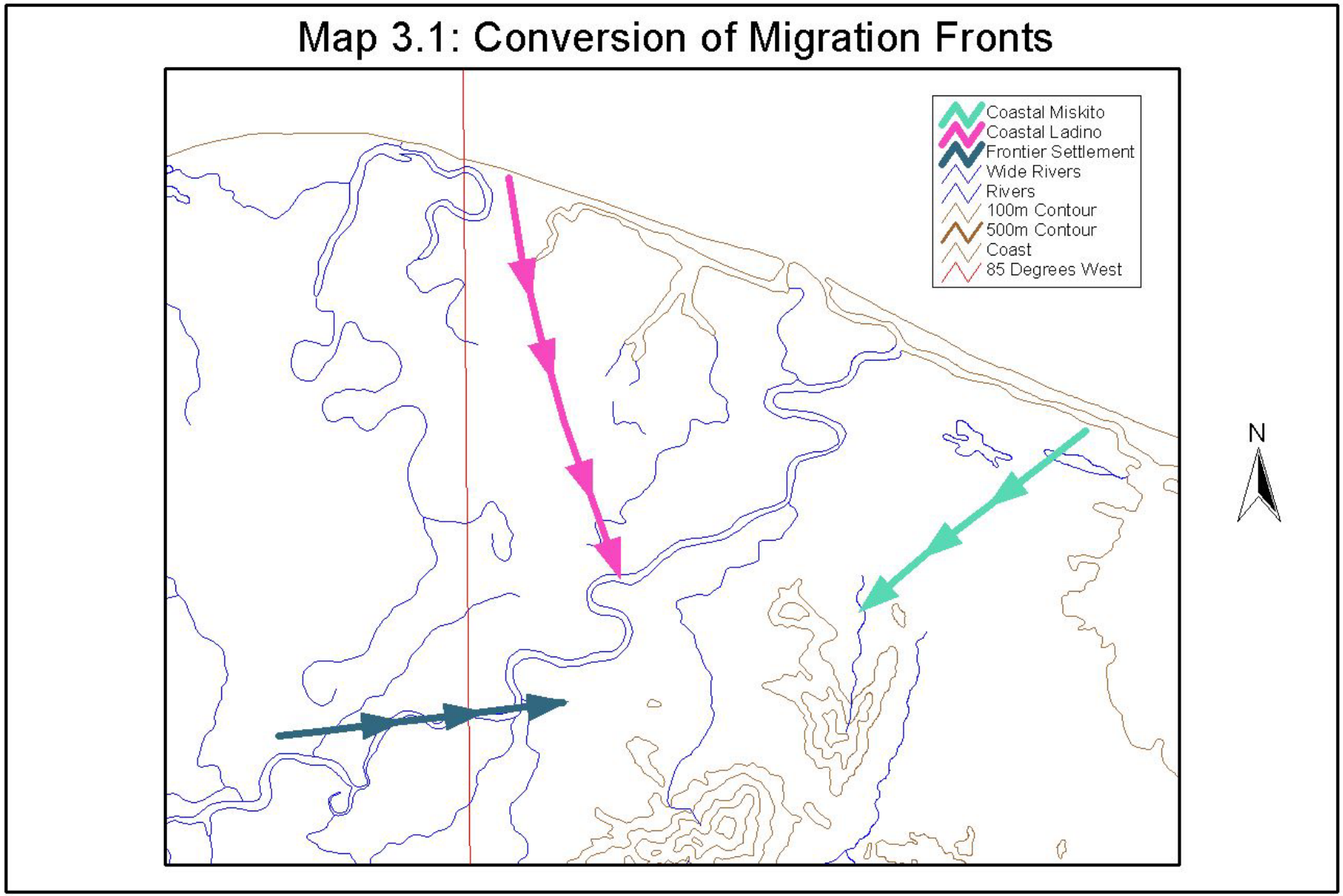
CHANGES IN SETTLEMENT

Frontier settlement receives a significant amount of attention and blame for deforestation and environmental degradation in developing countries. The term typically evokes images of farmers who, in looking for a place to settle down and begin etching their lives out of the land, continuously push farther ahead into "pristine" territory. In reality, the process is more complicated than that. The term frontier settlement overshadows less conspicuous changes that also may be contributing to the degradation of the environment. Within the study area three distinct migration flows are driving land use and land cover change. This chapter will describe the processes that are occurring in terms of settlement change and will examine the role of these processes within the population growth of each community in the study area.

Three Types of Settlement

The three types of migration flows in the study area are: Ladino frontier settlement coming from the west, coastal Ladino resettlement coming from the north coast slightly to the west of the study area, and coastal Miskito resettlement coming from the north coast slightly to the east of the study area (see map 3.1). The first of these, Ladino frontier settlement, is the most visible and worrisome to conservationists and locals alike and often overshadows the other migration flows. In this case, Ladino frontier settlement resembles the typical images of farmers moving into the rugged frontier, clearing large patches of forest, hoping to begin a new life. This eastward migration of Honduran farmers created four communities in the study area (Guapote, Congo, Buenos Aires, and Brans) and added to three previously existing communities (Victoria, Limonales, and Chiquerito). The stories told by these settlers conforms to the cycle of poverty described in chapter two; a

Map 3.1: Conversion of Migration Fronts



downward spiral which is instigated by the co-existence of poverty and shortages of arable land in subsistence based populations. All looking for the same things expressed in various ways: "trabajar la tierra" (to work the land, G14)[1], "no habia trabajo, buscando la vida" (there was not any work, looking for life, BA11), "buscando ambiente donde podemos mantenernos" (looking for an environment where we could maintain ourselves, BR6), "queria desarollarme, buscando billetes" (I wanted to improve, looking for money, G17), "no tuvimos tierra para trabajar" (we did not have land to work, BA1), "trabajar la tierra, allá no hay tierra trabajar para los pobres" (to work the land, over there, there is no land for the poor, BA17). The other common response is that they followed a family member, but that family member usually came looking for land, work, and to establish a new life. A few miscellaneous reasons do exist, such as: they were running from the law, they left their wife, their land was flooded, and they were offered employment.

Coastal Ladino resettlement is the second type of settlement change. This population has typically used lands adjacent to the coastal community of Palacios for planting their crops. However, they have begun to move upriver into lands that were previously used by the coastal Miskito and a few Garífuna from Plaplaya. Their reasons for moving tend are similar as those cited by the Ladinos in the frontier settlement communities; they reflect the need for land in order to meet their basic needs. The main differences are that many maintain close contacts with their original location and these farmers are generally more familiar with their destination. Within the study area, this coastal Ladino population formed the community Fuente de Jacob and has encroached upon Limonales.

Coastal Miskito resettlement is the third type of settlement change in the study area. This refers to a change in the permanent residence of the coastal Miskito. As discussed in chapter two, many Miskito live on the coast and travel inland in times of planting and harvest. Some Miskitos have begun to settle permanently nearer to or on the land they use for subsistence agriculture.

[1] The letter-number notation is the reference numbers for individual respondents.

Some retain their homes on the coast for when they visit family or need to see a doctor, whereas others no longer have homes because of disintegration from neglect or because they sold it. The reasons given by the Miskito for their resettlement are similar to the reasons given by the coastal Ladinos: "Hay tierra aqui" (there is land here, L27), "Hay trabajo aqui" (there is work here, L31), "No hay nada, solo anda vagos ahí" (There is nothing there, only the lazy ones, B1-C), "Ibans no tenia trabajo, [aqui hay] mejor trabajo en la agriculture" (Ibans does not have work, here there is better work in agriculture, B23-6), "sembrar comida" (to plant food, B24-6), "luchar, pasar la vida" (to struggle, to spend my life, B24-7), "Aqui es zona de trabajo" (This is where we work, L35), "Alla, no hay nada, aqui hay arroz y chanchos, los campesinos tienen que estar en el monte" (There, there isn't anything, here there is rice and pigs, farmers have to be in the forest, L19). Like the coastal Ladinos, the Miskito also tend to maintain close contact with their original communities and are often very familiar with their new location. Banaka, Limonales, and Chiquerito were founded and populated by the coastal Miskito.

Ladino Frontier Settlement

The communities that have been founded by the Ladino frontier settlement are Buenos Aires, Brans, Guapote, and Congo. The riverine communities of Chiquerito (mixed) and Victoria (Ladino) were founded in the early 1900s, but experienced significant growth due to the passage of the frontier. In addition, a few of the frontier Ladinos settled in the Miskito community of Limonales.[2] Table 3.1 shows the approximate year each community was founded and the number of households that can currently be found there. This table suggests that although statistically there is a relationship between community age and size, community age is not always a reliable predictor of community size.

[2] Some communities will appear under more than one type of settlement. Limonales, which absorbs settlers from all three fronts, will fall into all three categories. Chiquerito is affected by both Ladino frontier settlement and coastal Miskito resettlement.

Table 3.1: Age and Size of Frontier Communities

Community	Founded	Number of Households, 2001
Congo	1999	1
Brans	1997	10
Buenos Aires	1993	7
Guapote	1983	24
Chiquerito	1940	9
Victoria	1930	19
Limonales	1890	47

Table 3.2 depicts the growth of the communities over the past 20 years. These figures represent the percentage of the current population that was present during each era, showing how population has grown due to frontier settlement.[3] Only one frontier settler was there prior to this 20-year period, Guapote's founder settled there slightly more than 20 years ago. This chart shows that Chiquerito and Victoria have grown substantially because of frontier settlement, with only 43 percent and 24 percent of their residents resided there for more than 20 years. The reason for consistent rates of Ladino frontier settlement in Victoria, as compared to Chiquerito, is because Chiquerito was originally Miskito and there have been conflicts with the more recent

Table 3.2: Percent of Current Households Present Over the Past 20 Years

Community	pre-1982	1982-1986	1987-1991	1992-1996	1996-2001
Congo					100
Brans					100
Buenos Aires				83	100
Guapote	7	15	27	50	100
Chiquerito	43	86			100
Victoria	24	29	41	59	100

Ladino settlers. Therefore new settlers tend to settle in Victoria. The frontier first permeated these riverine settlements 20 years ago, but it was not until 1992 that the frontier exploded into the interior, three of the four communities being established in the 1992-2001 time period. Guapote,

[3]Frontier Ladino settlement in Limonales has been minimal, changes in population are mainly due to coastal Miskito resettlement. Therefore, it is not included on this chart.

the oldest frontier community in the study area, is a spatially extensive community and continues to grow steadily. In comparison, the communities of Buenos Aires, Brans, and Congo are relatively new and have significantly fewer households than Guapote (Table 3.1). There was a strong consensus among the settlers why they came to the study area (Table 3.3). In the newly founded communities the majority of settlers stated that they came to this area for land.

Table 3.3: Reasons for Migration Among Frontier Settlers

Community	Land	Job Opp.	Family	Inheritance	Other
Congo			100%		
Brans	70%		20%		10%
Buenos Aires	87%		13%		
Guapote	65%	15%	15%	5%	
Chiquerito	29%	14%	43%		14%
Victoria	11%	11%	39%	11%	28%

The category "land" includes three responses, those who were looking for land to work, looking for a better life, and looking to support their family. In the latter two responses it is understood that having land and working that land is the way to a better life and to support a family. In the older communities of Victoria and Chiquerito, the desire for land does not carry the same importance. Instead, new residents more likely settle there because they had family in those communities. The lack of settlers coming to this area for land is very easy to explain, no land is available. The majority of residents in these two villages borrow their land from the large land owners who reside on either side of these two communities and across the river. This long standing arrangement will be addressed further in chapter five. Congo's only household migrated to the area in pursuit of other family members. However, there are four landowners who bought land within the past year, but have not yet cleared the land or built homes. These men were not available to answer the questionnaires. If they had been available, the reasons for their movement would most likely resemble those of Guapote, Buenos Aires, and Brans.

A fourth focus of the research regarding settlement was the origins of these settlers. Each community has a variety of origin points, however there is usually one or two destination pairs for each community, exemplifying chain migration on a small scale (Table 3.4). For example, in Brans three of the households came from Zambita and another three from Chiquerito or Victoria. When examining the weight of the origin communities, the predominance of certain areas becomes obvious, both at a national scale and at the local scale. Map 3.2 displays the amount of migration originating from other departments, making clear the predominance of migrants coming from the neighboring department of Colon. In Table 3.4, the second grouping of origin locations are the migration flows from individual towns within this department. Migration from Colon represents approximately 68 percent of the migration coming into the study area. Within that grouping the neighboring towns of Zambita, Castillo, and Sico (from the municipality of Iriona) account for 45 percent of the migration, which is 31 percent of the overall migration to the study area. Map 3.3 depicts the frequency of origins by municipality.

Returning to Table 3.4, the first grouping, Chiquerito/Victoria, is within the study area. These two towns play an important role in chain migration, they account for 15 percent of the settlers in the other eight communities. Newcomers will often settle there and many residents decide to move deeper into the RPBR. Brans is a good example of the importance of Chiquerito and Victoria as a temporary settlement in the larger process of step migration, three of their ten households are from Victoria and Chiquerito. The third grouping consists of the remaining origin locations, listed by department (also depicted in Map 3.2).

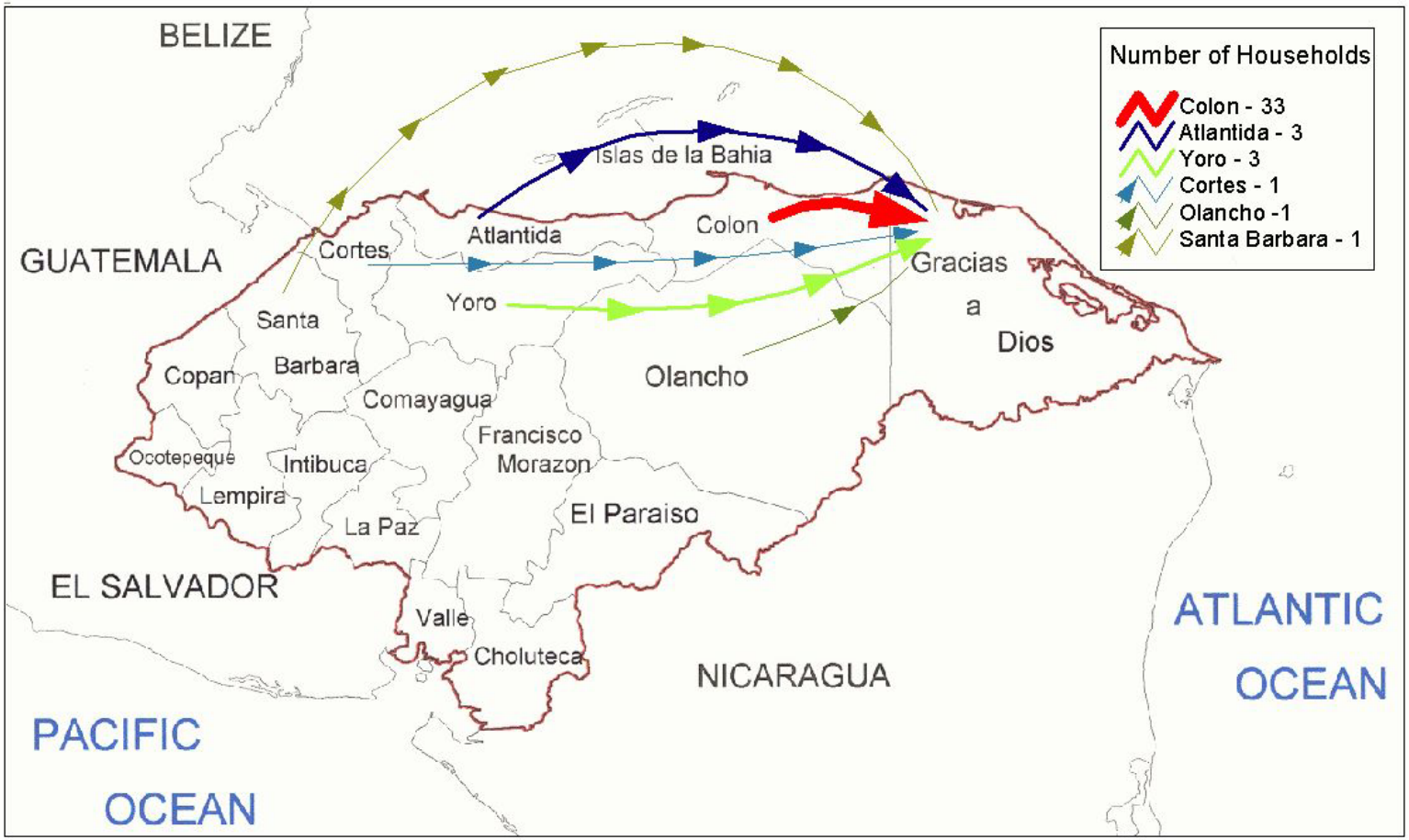
Coastal Ladino Settlement

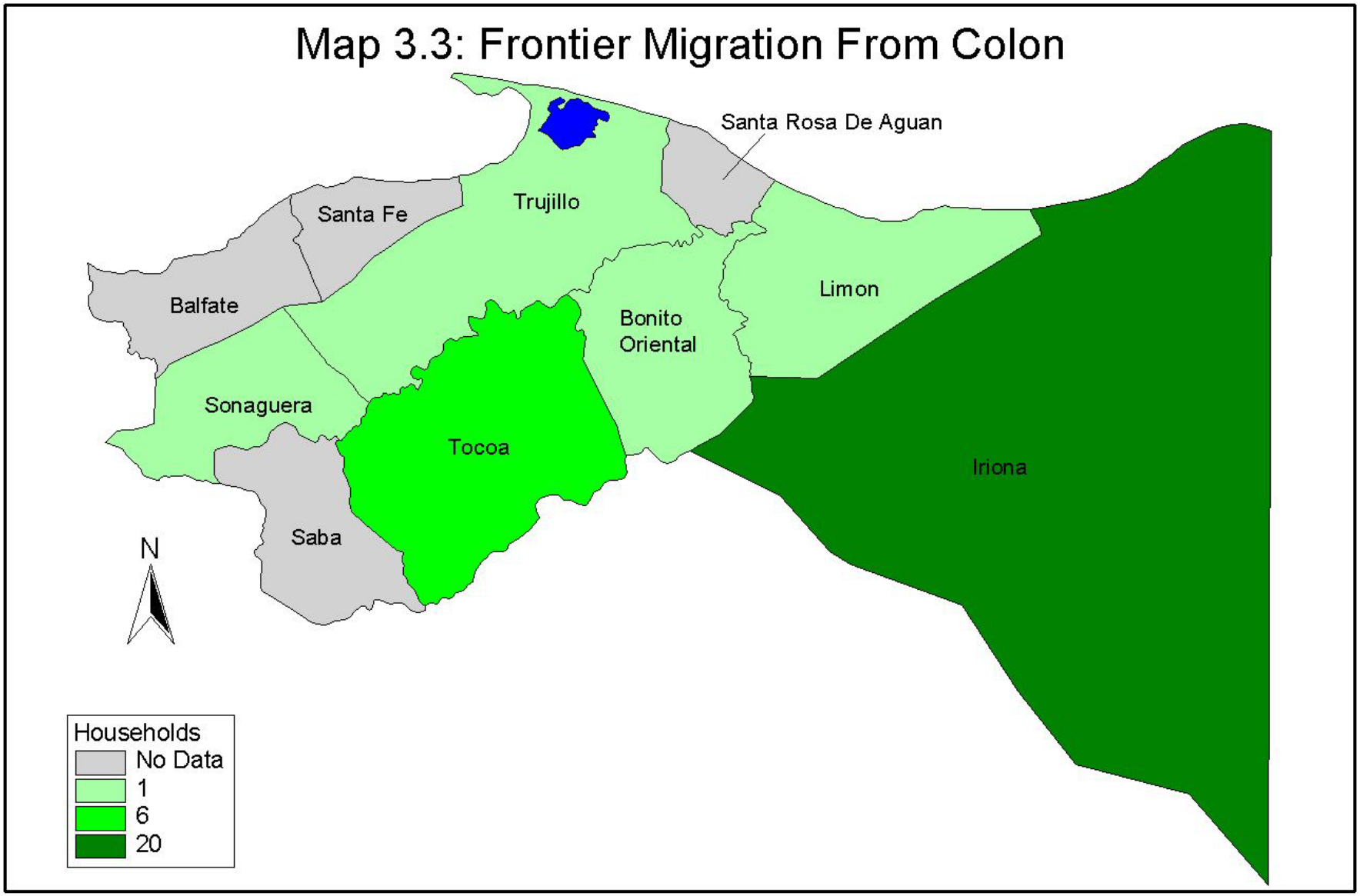
The Ladino population on the north coast traditionally keeps subsistence plots just inland or south of their coastal residencies. However, over the past 20 years, residents of San Pedro, Palacios (formerly known as the Black River Settlement) and Plaplaya began to resettle upriver. Seven households from San Pedro integrated into the communities of Victoria and Chiquerito. The San

Table 3.4: Migration Fields for Households in Ladino Communities

Origin	Destination					
	Vic.	BA	Brans	Guap.	Congo	Total
Gracias a Dios						
Chiquerito/Victoria			3	5	1	9
Colon						
Zambita		2	3	2	4	11
Castillo	1			2		3
Sico	1		1	2		4
Iriona				1		1
Champas	1					1
Trujillo			1			1
Tocoa	3	1	1	1		6
Limon				1		1
Bonito Oriental				1		1
Town Unspecified	2			2		4
Atlantida				3		3
Olancho			1			1
Cortes	1					1
Sta. Barbara		1				1
Yoro		2		1		3
Other				1		1
Total	9	6	10	22	5	52

Map 3.2: Other Departments as Sources of Frontier Settlement




Map 3.3: Frontier Migration From Colon
Santa Rosa De Aguan
Trujillo
Santa Fe
Balfate
Limon
Bonito
Oriental
Sonaguera
Tocoa
Iriona
Saba
N
Households
No Data
1
6
20

Pedro households account for 16 percent of the households in Victoria and 44 percent of the households in Chiquerito. These families impact population density and increase the pressure on the local natural resources, however, their impact is far less than the migrants from Palacios and Plaplaya that founded and settled Fuente de Jacob. Unlike residents of Fuente de Jaocb, residents of Victoria and Chiquerito generally do not own land, instead they work on the land of neighboring landowners. The new settlers of Chiquerito and Victoria followed this pattern, using only the land their home is built on. They contribute indirectly to the increasing rates of extensive land use by working for the large landowners and "pushing" other households into the interior of the RPBR by increasing the population density and pressure on natural resources.

The first permanent household in Fuente de Jacob was established in 1984; as of 2001 it had grown to 19 households. The majority of this growth took place between two specific times periods. By 1986, 11 percent of the current population was present, another 39 percent of the current inhabitants arrived between 1987 and 1991, another 16 percent arriving between 1992 and 1996, and during the last five year interval, 1997-2001, 33 percent of the current population arrived. The largest wave of people, 39 percent, appears to be a response to the initial increase in land clearing. The second wave, in the last five-year interval, was made of young men who were recently married and were looking for land to establish themselves. Many of these young men have fathers or uncles with land in Fuente de Jacob who told them there was land available.

These land owners came for the same reason as did the residents of the other newly founded communities, 77 percent were looking for land as a means for survival and hopefully to improve their standard of living a little. A small percentage, 10 percent, came because they inherited the land from their fathers, and the remaining 13 percent were there for other reasons.

Although Fuente de Jacob was initially founded by the Ladinos from the coast, a few settlers from the Ladino frontier have moved into this community. Seventy-eight percent of the community

is from Palacios or the neighboring community of Plaplaya. However, 22 percent of the population reflects the settlers from the frontier, which has recently passed into this area.

Coastal Miskito Resettlement

Traditionally, the Miskito typically reside on the coast and travel upriver to their subsistence plots during the agricultural season. In the past few decades some residents have elected to reside nearer to their subsistence plots. Therefore, there is a migration of Miskito "upriver" to areas that were previously allocated specifically for agricultural use. The communities that have been formed or affected by this type of migration are Limonales, Banaka, and Chiquerito. Table 3.5 shows the approximate founding date of each community and the current number of households in the communities. According to community members, Limonales was founded by Nicaraguans Fidel Gonzalez, his brother, and his cousin in the late 1800s. These men married Miskito women and the town became a Miskito settlement. Banaka was exclusively an agricultural settlement in the early part of the 20th century, with the first permanent residences being established around the 1930s. Chiquerito, which was discussed previously, was founded by a Miskito family that moved upriver in the early 1940s.

Table 3.5: Size and Age of Miskito Communities

Community	Founded	Number of Households
Limonales	1890	47
Banaka	1930	39
Chiquerito	1940	9

Table 3.6 shows the percentage of households in these communities that settled there as part of re-settlement as opposed to locally born. Chiquerito is not included since it has only been affected by the Ladino colonization front.

Table 3.6: Percent of Miskito Residents who Re-Settled

Community	Percent Re-Settled
Limonales	40
Banaka	87

The rate of migration is expressed chronologically in table 3.7. Together, Tables 3.6 and 3.7 show that in Banaka 87 percent of households have migrated to this new community, more than 60 percent of the households arriving in the past 20 years. In Limonales 40 percent of the population was born elsewhere and migrated, 29 percent of the households arriving in the last 20 years.

Table 3.7: Percent of Current Residents that Previously Resided in the Study Area

Community	pre-1982	1982-1986	1987-1991	1992-1996	1997-2001
Limonales	71	73	80	87	100
Banaka	39	55	61	74	100

The reason why the Miskito decided to reestablish themselves upriver appears to be similar to the newly founded Ladino communities (Table 3.8). The Miskito found it easier to live near their land upriver than to stay on the coast. There was work upriver, a way to maintain their families; they were looking for the same sense of security as the Ladinos. However, in this type of re-settlement, the Miskito changed their place of residence without major alterations to land distribution and land tenure. The push factors for the Miskito also differ, they are less likely to be poverty and lack of land and more likely to be one or more of the following negative factors: fast pace of life on the coast, the presence of alcohol and drugs, and limited options.

Table 3.8: Reasons for Migration Among Miskito

Community	Land	Job Opp.	Family	Other
Limonales	34%	2%	4%	
Banaka	68%	6%	3%	10%

Table 3.9 shows that the majority of Banaka's migrant population is from the coastal Miskito settlements. In comparison, Limonales has fewer migrants from the coastal Miskito communities and a greater number from the Ladino communities in Colon.

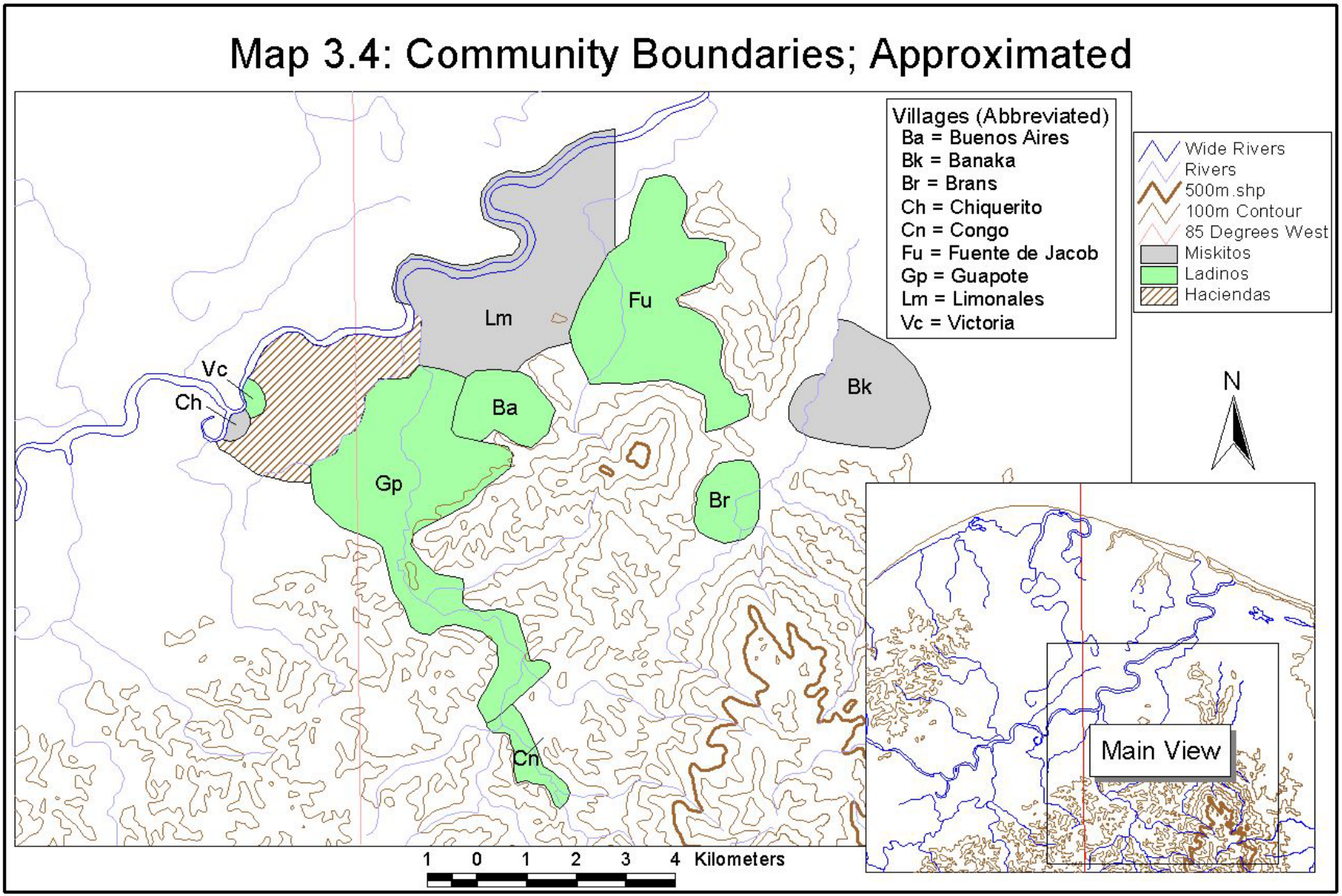
These numbers point to the fact that Limonales is a convergence point for the three separate changes in settlement patterns, a Ladino colonization front, an upriver migration of Miskito, and an upriver migration of long-time coastal Ladino residents.

Table 3.9: Migration Fields for Coastal Miskito Communities

	Cocobila	Ibans	Belen	Other Mis	Colon	Coastal Ladino
Banaka	12%	47%	18%	24%	0%	0%
Limonales	39%	0%	6%	11%	28%	17%

Overall Spatial Implications

The movement of settlers within the study area depicts three important processes. The first is the convergence of the three settlement fronts, two from the north and one from the west (Map 3.1). A second important process is the tendency of these settlers to meander along the lower elevations. As can be seen by the extension of Guapote (Map 3.4), the settlers tended to avoid the more mountainous areas. Brans and Congo are on the edges of the frontiers and may be indicators, when taken into account with natural barriers, of where new settlers may advance. The third process is the tendency of some settlers to "fill in the gaps" instead of pushing out beyond the frontier, which is what happened in Buenos Aires (Map 3.4).


Map 3.4: Community Boundaries; Approximated
Villages (Abbreviated)
Ba = Buenos Aires
Bk = Banaka
Br = Brans
Ch = Chiquerito
Cn = Congo
Fu = Fuente de Jacob
Gp = Guapote
Lm = Limonales
Vc = Victoria
Wide Rivers
Rivers
500m.shp
100m Contour
85 Degrees West
Miskitos
Ladinos
Haciendas
N
Lm
Fu
Vc
Ch
Ba
Bk
Gp
Br
Cn
Main View
1 0 1 2 3 4 Kilometers

CHAPTER FOUR:

MISKITO SUBSISTENCE

Daily life for the Miskito reflects the importance of meeting basic needs. Every morning, women start to rise at 4:30 to start the fire for breakfast. Those who try to sleep late (past 5:30) are awakened by neighbors who are clamoring noisily, preparing for the day. An early breakfast is important for the men who often leave early in the mornings and for many of the children who go to school. Depending on the time of year, the men will have different responsibilities. During some of the months they will work in their own fields, chopping, planting, weeding, or harvesting or they may be assisting a family member in the same tasks. When there is no agricultural work to be done there are several other options: working for one of the large land owners in exchange for 50 Lempira a day (slightly more than $3), improving homes, building boats, traveling to the coast, or visiting other households in the community. The women will typically spend much of the day cooking, cleaning, and washing laundry. However, there is usually an hour or two sometime during the day to go and visit neighboring friends and family. During the agriculturally demanding periods some women will also help the men with clearing, planting, and harvesting. Adolescent children, especially sons, will also help with the agricultural chores. The men usually return from work between 2:00 and 4:00, the remainder of the daylight hours spent resting or visiting. By 7:00 most people are in their homes, if not already asleep. Two exceptions to the regular routines are Sundays and the particularly rainy periods. On Sundays, many families will attend church in the morning and the men will typically not work, although some consider Sundays their opportunity for hunting or fishing. During the heaviest periods of the rainy season, life seems to slow to a crawl. There is no work, and travel even from one end of the village to the other can be very unpleasant due to ankle-deep mud that blankets all of the paths.

For the Miskito, survival is dependent on a network of subsistence activities. As can be seen in the previous paragraph, the most important, as well as spatially expansive, is agriculture. Other areas of subsistence that contribute to their well-being include animal husbandry, hunting, fishing, and gathering materials for medicinal purposes, the construction of boats and homes, and fuel gathering. The Miskito in the study area also engage in supplementary cash earning activities. Two broadly available options to earn money in this area are diving for lobster and working for large land-owners. As activities chosen vary by community, their frequency in each Miskito community and the time dedicated to these pursuits will be elaborated.

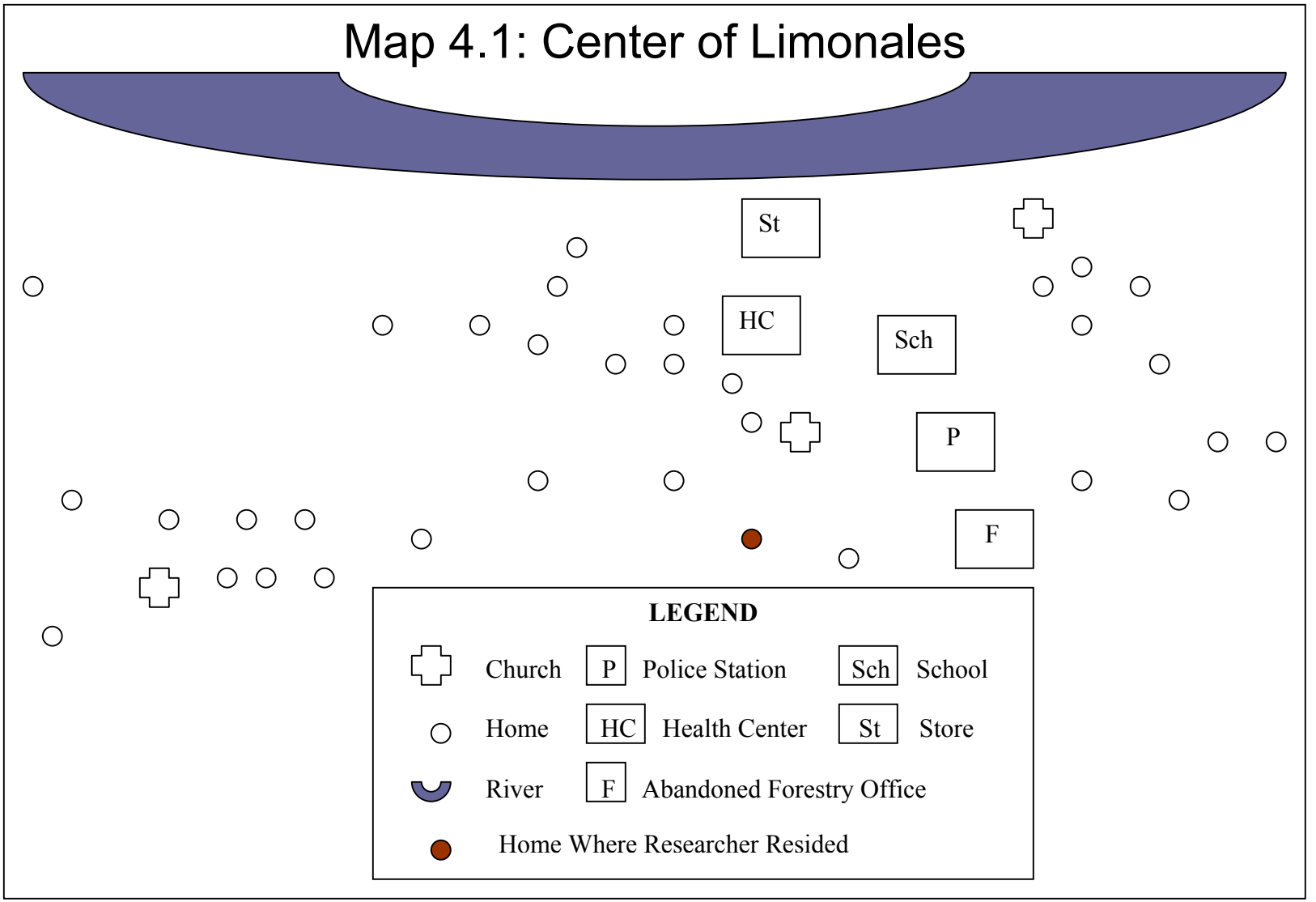
Agriculture

Miskito agricultural activities occur in two separate spheres: the subsistence plot and the *solar*. The subsistence plot is located outside of the community, with the distance from the community that can vary from a five minute walk to an hour's hike. These plots provide the majority of the food items for the family and they are typically used for the cultivation of rice, beans, and corn, along with some manioc, plantains/bananas, and possibly some fruit trees. The *solar*, which is the individually owned parcels of land within the community proper where families build their homes, tend some livestock, and plant small gardens. To visualize the difference in these two realms it is useful to first consider the settlement patterns of the Miskito in the study area.

The two Miskito communities, Banaka and Limonales, have similar settlement patterns. The majority of homes are clustered around a central area where one or more churches, a school, and a store are located. As one moves away from this center the houses become more scattered. At about a 10 minute walk from the center the houses are scarce. Map 4.1 depicts the community of Limonales.

In the communities each home is built on a small plot of land that belongs to each household; this small plot is often referred to as a *solar*. The sizes of the *solares* vary, from approximately 400 m^2 to 5000 m^2. The *solares* toward the center of the village tend to be on the smaller end, with sizes

Map 4.1: Center of Limonales



increasing as one moves away from the center. The boundaries of these *solares* become more clearly defined as population densities increase. Where there is a high demand for land there is usually a tell-tale feature in the landscape that demarcates the bounds between neighbors. It may be as obvious as a fence, or slightly less obvious as in a small path, or the edge of a cleared area. In areas where there is not yet such a high demand for land, demarcation is often inconspicuous. In Limonales, where there is a higher demand for land, demarcations between *solares* are very clear; whereas in Banaka, there are a few *solares* that are clearly demarcated, but the landscape does not create the same tight jigsaw-puzzle-like pattern. The bounds may align with trees, streams, or a large rock in the landscape. Where the demand for land is extremely high, there will be an active buying and selling of *solares*. People who purchase a *solar* often begin planting some long-term crops such as manioc or plantains and possibly some fruit trees before they will begin building on the *solar*.

Subsistence plots are larger areas of land located outside of the village proper. In the study area the range in distance was approximately 1/8 of a mile to over three miles from the home to the subsistence plots. In areas with a higher agricultural density, such as Limonales, the contiguous patches of land in various stages of cultivation and fallow form a heavily manipulated landscape. In areas of lower agricultural densities, such as Banaka, one is more likely to find areas of forest between the subsistence plots.

Uses of *Solares*

Kitchen or dooryard gardens are regarded as valuable spaces for several reasons, they: provide supplemental food for both consumption and the market, are sources of medicinal plants, traditionally have high levels of biodiversity, serve as centers of plant domestication and experimentation, and facilitate the horticultural education of children (Anderson 1967, Keys 1999, Kimber 1966, 1973, 1987, Netting 1993, Sauer 1947, Steinberg 1998, Wagner 1958). While

obviously related in a general fashion to kitchen or dooryard gardens, the Miskito *solar* deviates from the pattern in several ways.

Solares are the small plots of land where the Miskito customarily build their homes and plant a small garden, the presence of either varies. Some of the *solares* in Limonales were recently sold to other residents and were solely being used for crops, whereas others were unused but held on to for future use. Of the 45 houses in Limonales, 37 have planted crops, flowers, or herbs in their *solar* (82 percent). Of the 8 that do not have *solares* 5 do not have them because it is a new residence for them or because they are caretakers, and therefore is not their residence. In Banaka, only 64 percent of the households interviewed have *solares*. Two possible reasons exist for the difference between the two communities. First, as mentioned earlier in regard to demarcation, is the higher agricultural densities in Limonales which would lead to the need to use the *solares* more intensively. The second possibility would be due to times spent away from the village. Banaka's population has tighter connections to some coastal communities in terms of family and employment. In family units, they travel to the coast more often than Limonales residents. As a result they may not need the crops due to access to other food stuffs on the coast or the time away may make maintaining a *solar* difficult. In both communities, families may also have *solares* in other communities, where they have family, where there are amenities, or where they are thinking of building in the future.

Cultigens found in the Miskito *solares* include: annatto, basil, cotton, lemon grass, cilantro, mamey, avocado, red chilies, coconut, bananas, plantains, bread fruit, sour sop, guayava, lemon, lime, mango, nance, rose apple, passion fruit, cashew, orange, oil palm, papaya, pineapple, pumpkin, sugar cane, watermelon, iron wood, and grapefruit. The most common of these were bananas, plantains, and coconuts. The scientific names of the crops utilized in the study are listed in Table 4.1.

Table 4.1: Staple Crops, Fruit Trees, Herbs, and Condiments Found in Study Area

English Name	Spanish Name	Scientific Name
annatto	achiote	Bixa orellana
avocado	aguacate	Persea nubigena
bananas	guineo, minimo	Musa spp.
	chata	Musa sp.
	filipina	Musa sp.
basil	albahaca	Ocinum micranthu
beans	frijol	Phaseolus vulgaris
breadfruit	mazapán	Artocarpus altilis
cacao	cacao	Theobroma cacao
cashews	marañon	Anacardium occidentalel
chile, red	chile	Capsicum annum
cilantro	culantro	
coconut	coco	Cocos nucifera
cocoyam	malanga	Xanthosoma sagittifolium
cotton	algodon	Gossypium sp.
grapefruit	toronja	Citrus maxima
guayava	guayaba	Pisidium guajava
iron wood	tamarindo	Dialium guianense
lemon	límon	Citrus limon
lemon grass	zacate de limon	Cymbopogon citratus
lime	lima	Citrus aurantifolia
maize	maiz	Zea mays
mamey	zapote	Pouferia mammosa
mango	mango	Mangifera indica
manioc	yucca	Manihot esculenta
nance	nance	Byrsonima crassifolia
oil palm	yolilla	Elaeis olefeira
orange	naranja	Citrus sinensis
papaya	papaya	Carica papaya
pineapple	piña	Ananas comosus
plantains	plátano	Musa spp.
pumpkin	ayote	Curcubita pepo
rice	arroz	Oryza sativa
rose apple	manzana	Eugenia jambos
soursop	guanábana	Annona Americana
sugar cane	caña	Saccharum officinarum
sweet potato	camote	Ipomoea batatas
taro, dasheen	malanga	Colocasia esculenta
watermelon	sandía	Citrullus lanatus
yam	name	Diocorea

In addition to food and herbs, the *solar* also serves as a place to keep domesticated animals. Miskito generally allow the livestock to roam freely around the village, and it is that way in Banaka. However, in Limonales there has been some changes. The police, who arrived in the fall of 1999, are enforcing an ordinance against vagrant cows and pigs. Therefore, all the community members must keep pigs and cows tied up in their *solares*.[1]

Limonales was fortunate enough to be the recipient of a water project, which included selecting the water source, demarcating the basin, installing miles of pipelines to each household, installing spigots for each household, and constructing latrines for each household.[2] As a result, in Limonales there is a water spigot and latrine in the majority of *solares*. This now allows several activities to take place at the home, such as washing laundry, bathing, elimination, and the collection of water for cooking and drinking.

Subsistence Plots

The Miskitos in the study area own one to three parcels of land. Those in Chiquerito and Banaka own only one parcel, whereas in Limonales people own up to three different parcels of land. Table 4.2 shows that six people in Limonales do not own any land. Two of these are professionals and do not partake in agriculture. The remaining four are newly married couples whose fathers own an above average amount of land, so they are using their fathers' land with the expectation that the part they work will become theirs.

Individual owners often distinguish between their parcels by referring to their location. The most common references are often to the parcels on the *vega* or the *cerro*. The *vega*, which literally means a fertile lowland, refers to the river banks on the other side of the river. The *cerro*, which literally means hill, is found on the same side of the river as the community, but farther inland

[1] This ordinance is deemed important by the police and some community members' because of health reasons and the tendency of the larger animals to destroy community members *solares*.
[2] Limonales is the only village in the study area to have received this type of assistance. The rest of the communities are dependent on local streams or rivers.

Table 4.2: Number of Parcels Owned by Limonales Residents

No. of Residents	No. of Parcels
6	0
20	1
11	2
8	3

behind the village, where elevation increases slightly and the ground is drier. The in-between area is the land adjacent to the village, but not quite yet to the *cerro*, where several people have plots.

The *vega*, the stretches of fertile alluvial soils that line the rivers, is the traditional place for the Miskito to plant their crops. Although it is one of the most common areas for Miskito to grow crops, it is at risk for flooding which would damage certain crops. Crops that are more likely to be damaged are those that are in the ground closer to the wet season and root crops. For example, beans, when planted in January, may be flooded and ruined by late rains. Manioc and other root crops are usually not planted in these areas because they will be ruined by floods. Rice, if not harvested on time will be lost quicker in the *vega* than in other areas when the rains begin in October.

The community of Limonales utilizes the land on the west bank of the river for the majority of their *vega* crops. Many in Banaka use land along Banaka creek, but some have crops along some of the other creeks or in the *cerro*. The *cerro* refers to the upland areas behind the stretches of households that line the eastern riverbank. According to the Miskito this land is drier and less vulnerable to flooding, but the soil is less fertile and root crops are sometimes eaten by wild animals or stolen.

In Limonales, 38 percent of the plots are located in the *vega*, 36 percent in the *cerro*, and 26 percent in the in-between region referred to as *aqui* (here) or Limonales. Quantitative data for plot location is not available for Banaka. However, the majority of families have their plots along small waterways. The newer families are settling farther inland and using the land in the *cerro* for agriculture. It appears this is due to the shortage of land available along the waterways.

Crops

The six most common food items planted by the Miskito are beans, manioc, rice, bananas, plantains, and corn. Rice and beans are staples among the Miskito, so much so that a meal without rice is not a meal. (Note that this is contrary to the information provided by Helms and Nietschmann, where beans and rice were predominantly for sale.) Other common crops are dasheen, potatoes, sweet potato, taro, and yams, and a few households also plant coffee and cacao. Table 4.3 shows the percentage of people who planted rice, beans, corn, and manioc. Bananas and plantains were not included for several reasons. It is not a crop that is eaten on a daily basis, it is a crop that every resident has planted either in the active milpa, the fallowed milpas, or in their *solares*, and it is a crop that is regularly shared with friends and family as opposed to the other crops. The fact that there are scattered trees makes it difficult for the residents to count how many they have, although a few residents did have a few *tareas* dedicated solely to plantains and bananas. In addition, many people feel free to harvest bananas and plantains from trees that are not theirs.

In Table 4.3 the numbers in the parenthesis represent the percent of Miskitos who plant those crops.[3] In Banaka and Chiquerito residents regularly plant all four of the major staples. However, it should be noted that Chiquerito has a very small population and an unusual composition. Of the four Miskito households, one of the Miskito households was the new pastor and his wife. Due to some of their beliefs about outsiders[4], they did not want to answer any of my

[3] In Banaka there are no purely Ladino households. The numbers were included in parenthesis for consistency.
[4] Several religious leaders believe and promote the fact that outsiders are sent by the devil.

questions. A second Miskito "household" is really three generations of Miskitos who live and work together utilizing a grouping of 4 buildings.

Table 4.3: Percent of Households that Plant Staple Crops, by Community*

Community	Beans	Rice	Manioc	Corn
Limonales	62 (74)	74 (88)	81 (86)	70 (71)
Banaka	96 (96)	96 (96)	100 (100)	96 (96)
Chiquerito	100 (100)	100 (100)	60 (50)	100 (100)

* the percent in parenthesis represents the percentage of Miskito households in each community that plant these crops.

Therefore, they have more laborers to plant crops, so it is more likely that everything will be planted. One of the five Ladino "households" is actually a group of primarily Ladino agricultural laborers who reside together on the hacienda at the southern edge of Chiquerito.

In Limonales, fewer people plant staples than in the other communities. This is due in part to the fact that there are several opportunities to earn cash. For example, there are store owners, middle men, teachers and carpenters that do not plant crops because they have the cash to buy food. However, the people who have these occupations tend to be Ladinos, which explains part of the difference between the Ladino and Misktio statistics. The Miskitos in Limonales are more likely to work as agricultural laborers than those in Chiquerito and Banaka, thus providing themselves with some cash. But, as will be explained in detail later, the amount of time they dedicate to wage-earning agricultural labor is significantly less during the seasons when preparing, planting and harvesting their own crops demand numerous hours of their time. In addition, the amount of cash they earn is not enough to buy food year round, which requires them to plant if they want to be guaranteed food throughout the year.

These crops are planted in a swidden-fallow agroforestry system as described by Denevan and Padoch (1987). A small section of the owner's land is chosen for planting and the natural

growth is cleared with a machete. Only the largest trees are left standing, but with the increasing availability of chainsaws, some farmers are beginning to cut the larger trees as well. The next step depends on the crops to be planted. For beans, they will be planted through the chopped weeds. For rice, corn, and manioc the fields will be left to dry for anywhere from 2 weeks to a month, then burned. To plant the farmers walk in straight lines through the plots with a pointed stick. At every pace they make a hole, dropping 2-6 grains in each hole. They alternate the sides where they pierce the ground, one hole will be in front of the left shoulder, the next in front of the right.

Figure 4.1 shows the annual agricultural calendar in the study area. The calendar is similar to those made by Nietschmann and Helms, depicted in Chapter Two. The slight differences in timing can be attributed to slight differences in the timing of the rainy and dry seasons along the coast. This calendar is the ideal, what farmers believe should be done. Abnormal weather patterns and family crisis may delay the timing, and at times, may prevent a crop from being planted that year. Another variation from this ideal is that most farmers only plant one crop of corn. In Limonales, 41 percent planted in the May/June season, 47 percent in the January/Febuary season, 9 percent in the September/October *wis* season discussed in chapter two, and 3 percent said they plant anytime throughout the year. In Limonales only 13 percent planted two crops of corn.

After the crops are planted, they need to be weeded. Most households begin weeding around one month after the seeds have been planted. This is usually done with a machete, except for the rice, where herbicide use is now standard. Eighty percent of the people use herbicides in Limonales, 72 percent of the people in Banaka, and 83 percent of the people in Chiquerito. The people who do not use herbicide are usually the poorest who can not afford to buy the equipment or the chemicals.

After these fields are harvested they are left to fallow, for the next agricultural cycle the farmer will move on to a new area. At times fields are planted for two consecutive years, but the

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Rice	C	C	C									
			B	B	B							
				P	P	P						
					W	W	W	W				
							H	H	H	H		
Beans	C											C
	P	P										
		W	W									
			H	H	H							
Corn	C1			C2	C2							C1
	P1	P1			P2	P2						
		W1	W1	W1		W2	W2	W2				
				H1	H1	H1		H2	H2	H2		
Manioc				P	P	P						

(Harvest continuous nine months-two years)

Figure 4.1: Subsistence Calendar Among Miskito of Gracias a Dios

Notes: C= clear, B= burn, P= plant, W= weed, H= harvest . 1= *primera*, first planting 2= *postrera*, second planting.

majority of the farmers limit planting to one. Newly fallowed plots are often sites where there may be plantains and bananas, and some root crops that the farmer will continue to harvest, making the plot an actively used fallow. Table 4.4 show the average amount of time a plot is left to fallow for each of the communities. The averages all fall between three and four years. This is considerably less than the 5-10 year fallow cited by Nietschmann (1973, 140).

Table 4.4: Average Fallow Periods in Miskito Communities

Community	Years
Limonales	3.8
Banaka	3.2
Chiquerito	3.5

One aspect of agricultural labor that the respondents often commented on was *pana-pana*. This refers to an ethic of generosity; the traditional sharing of labor and goods among family and close friends. Several farmers commented that *pana-pana* no longer exists. When one needs help either with planting or during food shortages, they can no longer depend on their extended family or community members as they once did. Only two situations were observed where *pana-pana* was utilized. The first was when parents with an extensive amount of land allowed their children's families to utilize that land as well. This family grouping would all clear and plant at the same time, assisting each other until everyone's parcels were planted. The second situation was when extended family members borrowed land, the favor was often repaid in labor.

The amount of land owned by individual households varies greatly by community. In Chiquerito, the families reported that they borrow lands from the neighboring land owners. Other Miskitos from neighboring communities reported that the Miskito in Chiquerito had land at one time, but sold it. Figure 4.2 graphs the land holdings of Limonales and Banaka measured in

manzanas (Mz), which is equal to an area of 100 yards by 100 yards or 9140 m^2. There is a much larger range of sizes in Limonales than in Banaka, but in both the modal value is 1-10 Mz per owner, whereas the median size landholding in Limonales is 14.5 Mz and 8.5 Mz in Banaka. The average landholding in Limonales is 51.1 Mz and in Banaka 19.9 Mz. The difference between these averages reflects the larger land holdings in Limonales. Both averages also show that the high-end outliers skew the reality for the majority of the people. In should be noted that this chart does not include three outliers from the community of Limonales. In these three plots land owners have approximately 200, 280, and 300 Mz. Among the large land owners in Limonales, the largest is a Ladino farmer that bought some of the land and cleared the rest.

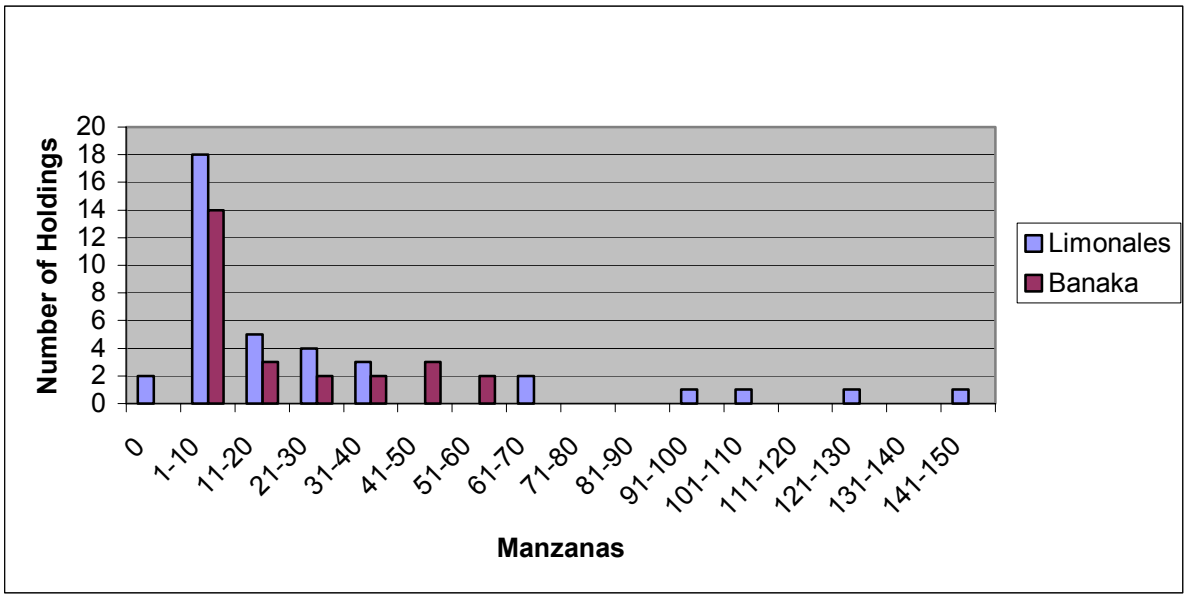


Figure 4.2: Miskito Land Holdings

Of the two remaining outliers not on the graph and the four landowners with more than 90 Mz on the graph all are Miskito. Four out of the six are residents whose families were some of the first to establish themselves in this area. However, they also allow their sons and their families to use their land, so these large parcels actually have at least 4 nuclear family units depending on them for their food. The other two large land holders exhibited more "Ladino" behaviors in that they moved directly to the unpopulated *cerro*, claiming more land than their family traditionally used. These

lands are on the outskirts of Limonales, in between Limonales and the neighboring community of Fuente de Jacob.

Protein Sources: Hunting, Fishing, and Livestock

As discussed in Chapter Two, hunting and fishing has traditionally supplied the Miskitos' dietary protein. Figure 4.3 depicts the frequency of hunting among the Miskito in Limonales and Banaka. Chiquerito is not included because it is sandwiched in between two haciendas, each covering hundreds of Manzanas, therefore there is no forest left to provide habitats for animals. In reality, hunting is no longer an option for those in Chiquerito unless they are traveling far from home. Seventy-eight percent of the households in Limonales do not hunt, whereas 44 percent

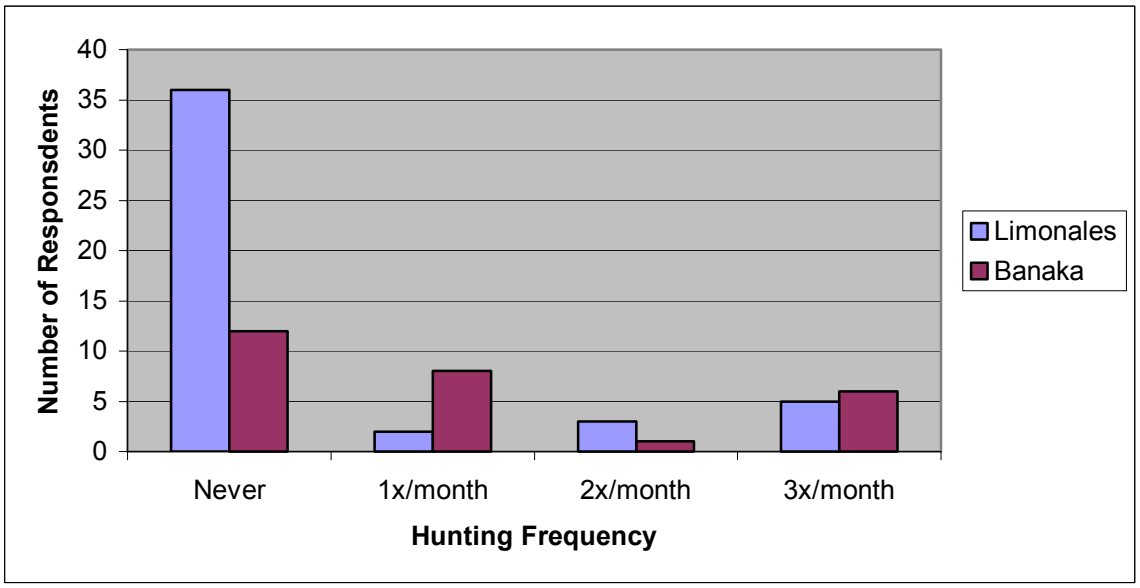


Figure 4.3: Hunting Among Miskito

of the residents in Banaka do not hunt. Twenty-two percent of the population hunt once a week in Banaka, only 11 percent of those in Limonales hunt once a week. The common reason given for the decline in hunting is "*no hay bosque*" (there are no forests). The difference between the two communities can be explained by the current location of the frontier, which currently lies passed Limonales but before Banaka, and the deforestation that accompanies the expansion of agricultural lands.

Figure 4.4 shows the frequency of fishing in Limonales and Banaka. Thirty-seven percent of the households in Banaka do not fish, whereas 41 percent of the households in Limonales do not fish. In Limonales those who do fish tend to fish once a week (44 percent of the residents). In Banaka those who fish tend to do so either once a month (33 percent) or once a week (22 percent). The numbers of those who do not fish are quite close, but the frequency of those who do varies. The most likely reason for his difference is the size of the water source available to each community. Río Negro is much larger than C*rique* Banaka and carries more fish. However, considering that fishing has traditionally been a major source of protein for the Miskito, these numbers are quite low. Limonales residents report that the water quality has been reduced

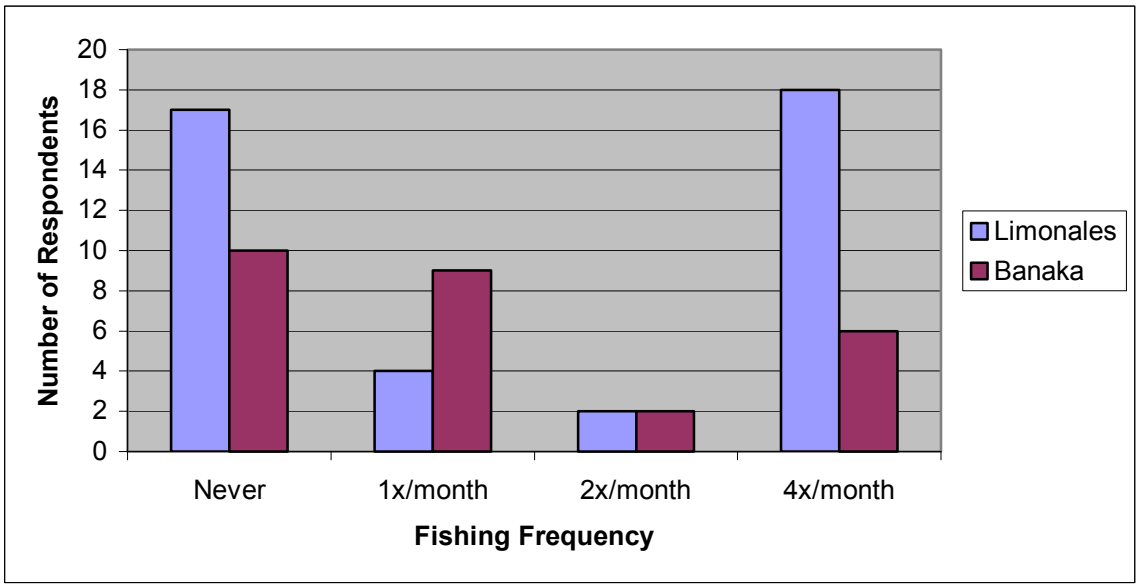


Figure 4.4: Fishing Among Miskito

drastically over the past 15 years, mainly due to increasing sediment loads. Land use changes upriver, the result of increasing settlement, have resulted in increasing deforestation rates and soil erosion, increasing the sedimentation of the river. In Chiquerito, which also borders Río Negro, only two of the seven households fish (29 percent), each fishing approximately once a week.

Livestock has traditionally played a small role in Miskito subsistence. Today, it is common for everyone to have a few chickens wandering around, and the number that each household has

fluctuates on a day-to-day basis. Chickens are regularly bought and sold, eaten, and sometimes stolen. Pigs and cows are more substantial investments, not appearing and disappearing so quickly. Pigs are often raised to be sold for meat whereas cows are kept to supply milk and to act as a bank account in case of emergency. In Banaka 42 percent of the residents own pigs, in Limonales only 30 percent, and in Chiquerito 55 percent. A major difference between swine ownership is the number of pigs that people have (Figure 4.5). In Banaka, 30 percent of pig owners have more than five pigs, with maximum holdings in the 11-15 category. In Limonales, 44 percent have more than five pigs with the maximum category being 6-20 pigs. In Limonales it is more likely to find larger

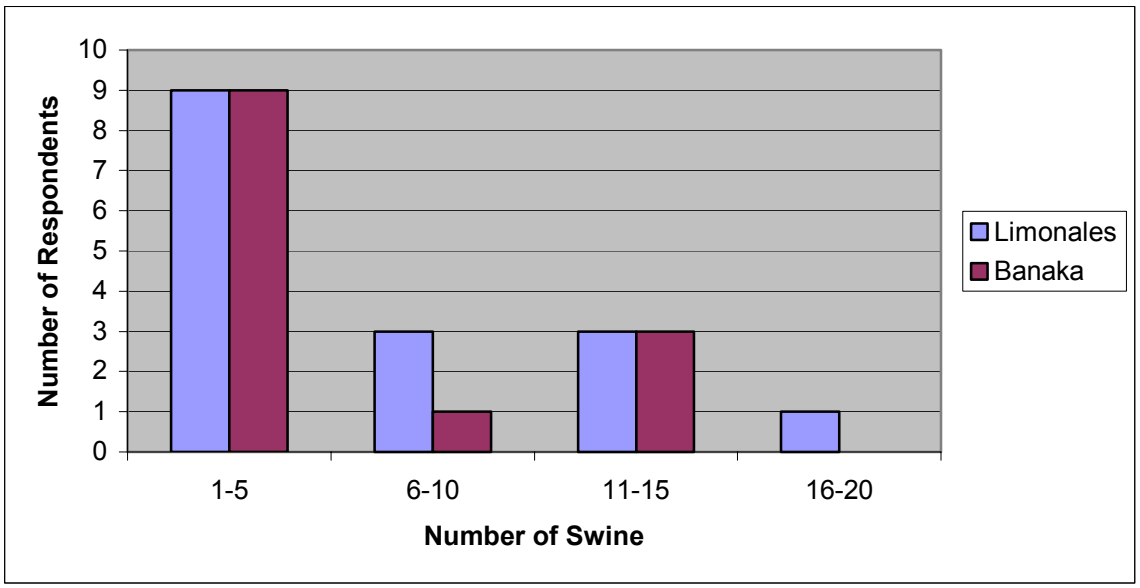


Figure 4.5: Swine Ownership in Miskito Communities

quantities of swine. Five of the Chiquerito residents have pigs. Three have fewer than five, one has seven, and the local hacienda has 15. Pigs are usually either kept tied up, which is required by law in Limonales to prevent the damage they may inflict on the neighbors *solares*, or are allowed to wander within and sometimes outside their owners *solar*. Pigs, especially when kept in large numbers, are often fed manioc. However, it is not unheard of to see them rummaging for food in a neighbors *solar*.

Cattle require a bigger investment, narrowing the pool of people who could afford to have them. Twenty percent of Limonales residents own cattle, 39 percent of Banaka residents, and 33 percent of Chiquerito residents. In Chiquerito one of the three households that own cattle is the local hacienda, where there are approximately 950 cattle (as an outlier, this figure is not included on the graph below). The other two residents that have cattle have fewer than five (Figure 4.6). In Limonales, 60 percent of cattle owners own more than 5 heads of cattle but most with 30 or less. Two individuals with an unusual amount of cattle are not included in Figure 4.6, they own 45 and 63 heads of cattle. In Banaka, where more people own cattle, the herds are much smaller. Eighty-four percent own fewer than 5 heads of cattle, with a maximum holding at 14. The cattle are

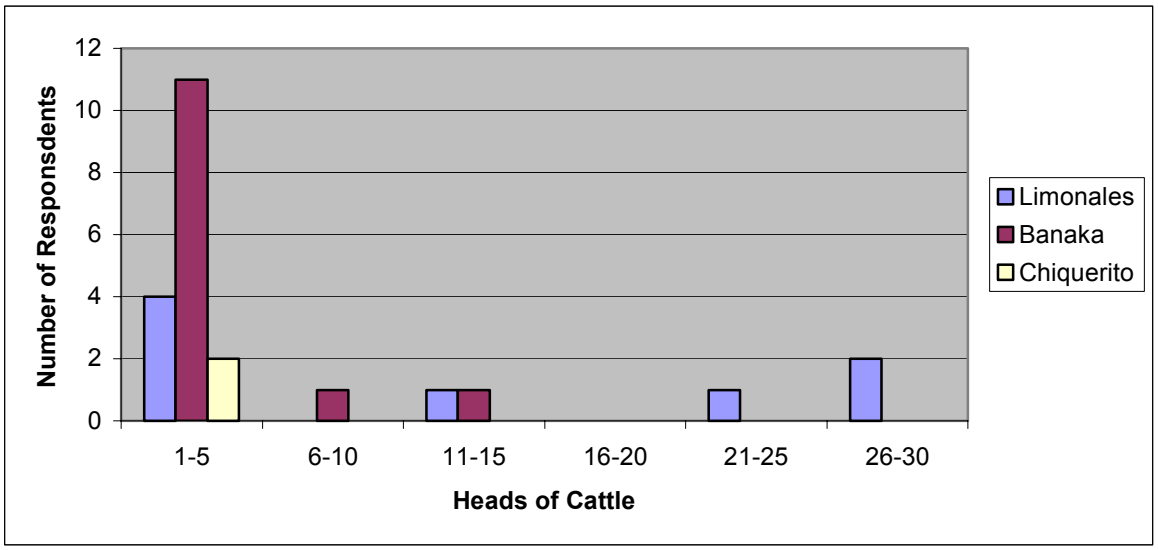


Figure 4.6: Cattle Ownership in Miskito Communities

generally kept in a fenced in enclosure, although it is not unheard of to see one roaming the village. Those with only one or two generally keep them in the *solar*, whereas larger numbers are often kept on one of the parcels outside of the village.

Gathering

Gathering is an essential part of Miskito culture. The collection of firewood, housing materials, medicines, and trunks for the carving of watercraft all rely on the quickly disappearing

forests. Traditionally, they use axes and machetes to collect the wood that is needed for the various tasks. Two major changes in their traditional routine are new tools and the distance they need to go to collect wood. In terms of tools, chainsaws are beginning to become available. In Limonales, 3 households have chainsaws, and the owners would lend or rent these to other community members. This has made it easier to gather the wood for making homes and to cut down trees for firewood or watercraft. However, the trees that are suitable for watercraft have become scarce. One Miskito who was being paid to make a watercraft for another household told me that they now have to walk four hours just to find trees that are suitable.

Wage Labor

Land use patterns of the Miskito include their wage earning activities, but these activities vary according to location. Banaka has stronger ties to the coast (because of location and the young age of the community), and therefore has more opportunities to earn cash there. When conducting interviews, there were 4 divers present. However, the homes that were unoccupied reportedly belonged to divers who were on the coast at that time. That would bring the number of divers in the community to 11. Several community members sell various goods: six sell their crops on the coast, two sell meat, and one sells wood. Fourteen additional households report working as agricultural laborers for wealthier residents. The manner of earning cash in Banaka and the percentages of people who partake in these activities are reported in Table 4.5.

Several differences exist between wage labor in Limonales and Banaka. The first is the percentage of people who dive. In Limonales, only 5 percent dive (Table 4.5). Other differences include a greater range of opportunities to earn money and the number of cash-earning activities one household will be involved in. In Banaka (Table 4.6), each household has a specific activity for earning money. However, in Limonales (Table 4.6), the percentage column adds to more than 100 percent, signifying that some households have diversified in the activities through which they earn money. In addition, Table 4.6 shows that over half of the population works as agricultural laborers.

Table 4.5: Wage Earning Activities in Limonales

Occupation	Percent[5]
Agricultural Laborers	53%
Selling animal products	28%
Other[6]	11%
Professionals	11%
Selling cut wood	9%
Store owners	7%
Middle-men	7%
Women's Employment[7]	7%
Divers	5%

Table 4.6: Wage Earning Activities in Banaka

Occupation	Percent
agricultural labor	38%
diver	30%
selling surplus crops	16%
selling meat	5%
other	11%

[5] Percent adds up to more than 100 because each household may be involved in more than one cash earning activity
[6] This includes selling crops, making boats, and Pastors.
[7] Some women in the community will bake bread and sell it or wash clothes for other families.

Chiquerito mirrors Limonales in that 75 percent of their households earn money as agricultural laborers. Their location, between two haciendas, is more conducive to this cash-earning activity.

The amount of time the Miskito in Limonales dedicate to working as agricultural laborers raised questions as to whether or not they were subtracting labor from their own subsistence crops to earn money from others. To determine whether or not this was true, two time allocation studies were conducted, one in fall of 2000 (low-intensity time for subsistence agriculture) and the other during spring of 2001 (high intensity labor requirements for subsistence agriculture). Of the 40 people who were accessible on a regular basis during both survey periods, 32 would work for other people. The remaining eight saw it as something negative and would not consider it.

Tables 4.7 and 4.8 depict the results of the daily activity surveys, which were conducted in Limonales to determine how the population allocates its time in regards to agricultural and wage earning activities. Table 4.7 shows how many people worked as agricultural laborers in the Fall of 2000. Out of the eight days that time allocation surveys were conducted, only one of the 32 people worked all of those days and two did not work at all in those eight days. Fourteen of the 32 people worked more than 50 percent of the days that the survey was conducted. The total amount of time given to agricultural labor during the fall was 128 days (the sum of the number of days interviewees dedicated to agricultural labor) out of a possible 256 (the number of interviewees multiplied by the number of days the survey was conducted), or 50 percent of the time.

In the spring of 2001 (Table 4.8), not one of the 32 people worked more than 50 percent of the time and eight of the residents did not work at all. The total amount of time given to agricultural labor (the sum of the number of days interviewees dedicated to agricultural labor) was 69 days out of a possible 320 (the number of interviewees multiplied by the number of days the survey was conducted), or 21.5 percent of the time. The results of the time-allocation survey shows that despite the widening availability of wage-labor, the Miskito continue to put their subsistence needs before cash earning opportunities.

Table 4.7: Time Allocation during Fall 2000

Number of Residents	Percent of Days Worked	Labor Expenditure in Days
2	0	0
4	12.5	2
4	25	4
2	37.5	8
6	50	6
3	62.5	24
9	75	15
1	87.5	54
1	100	8

Table 4.8: Time Allocation during Spring 2001

Number of Residents	Percent of Days Worked	Labor Expenditure in Days
8	0	8
8	10	8
4	20	8
6	30	18
3	40	12
3	50	15

Conclusions

The changes that are occurring within the Miskito communities and the differences that exist between them can be attributed to resettlement, increasing population pressure, and globalization and modernization. Together, resettlement, especially the passage of the Ladino frontier, and the increasing population densities has drastically impacted the agricultural density and land use practices of the region. The clearer demarcations of *solares*, the increasing intensity of land use, both temporally and spatially, and the decrease in hunting in both Chiquerito and Limonales exemplifies how the Miskito are responding to these changes. A larger array of cash earning activities in Limonales is also a result of the passage of the frontier. The increasing pressure on the natural resource base and the availability of fast cash has also impacted the proportion of the Miskito in Limonales who plant staple crops. It is not as imperative to do so when they can earn

money to buy food. One major difference that can be seen between Banaka and Limonales is the greater discrepancy between the "better off" and poor. There are landless in Limonales, which is also where you find the larger Miskito land owners. It also appears in animal ownership, there is a smaller proportion of livestock owners in Limonales, but there are much greater holdings than can be found in Banaka. In Banaka a greater proportion own livestock, yet the overall numbers are smaller.

Changes due to modernization and globalization can be seen in the availability of herbicides, the increasing numbers of homes with metal roofing, and the larger number and wider array of material goods, such as radios, refrigerators, and chainsaws, found in Limonales. This is partly a result of a more accessible location and a greater variety of cash earning opportunities.

CHAPTER FIVE:

LADINO SUBSISTENCE

The daily life of Ladinos closely resembles that of the Miskito; subsistence activities are a distinguishing feature. The Ladinos have to survive with the same resources, the same lack of infrastructure, the same absence of reliable employment. To be certain they will eat, they also need to rise early and begin working, either in their own subsistence activities or working for a neighbor to earn money. Land use among the Ladino is quite similar to that of the Miskito. These men utilize the same agricultural calendar, plot preparation, and planting techniques. Some of the major differences between the daily lives in Miskito and Ladino communities stem from scattered settlement patterns and the extensive clearing of land, which creates a stark contrast to the nucleated settlement pattern found in the Miskito communities. The Ladinos often settle so far from each other on large tracts of cleared land; so large that they often can not see or hear their neighbors. Consequently, there is very little interaction among community members and very little socializing. This isolation accentuates ones dependency on the environment around them, making life appear more challenging than in the Miskito communities. These settlement and land use patterns are two of the main differences between Miskito and Ladino communities. These and other significant differences will be addressed in this chapter. A basic understanding of how their land use practices differ from the Miskito and the spatial extension of these practices will clarify the duality of land use in the RPBR.

Ladino Settlement Patterns

The settlement patterns of Brans, Buenos Aires, Guapote, and Fuente de Jacob differ from the Miskito in three ways.[1] The first difference is in their location. Whereas the Miskito settle along the coast or rivers, the Ladino are settling inland, in what the riverine Miskito refer to as the *cerro*, which is at higher elevations and has less access to water. This is most likely because all of the land on the riverbanks has been settled or cultivated, forcing the Ladinos inland, past this primary settlement channel. The second major difference is that homes and cultivated lands are contiguous in the Ladino communities. Whereas the Miskito live on their *solar* and cultivate a separate piece of property or properties, the Ladino have one large cleared tract of land where they live and plant. This creates the third difference, which is the community layout. Miskito homes are nucleated around a central common area and are relatively close to one another because of the small size of the *solar*. The households in Ladino communities, located in the center of extensive tracts of land, are scattered; from one house you may or may not be able to see the next. For example, in Guapote it takes 3 hours on horseback to travel from the household in the northwest corner of the community to the one farthest to the southeast.

Victoria, being settled during an earlier wave of migration, has different characteristics than the remainder of the Ladino communities. It is a nucleated community, walking from one end to the other only takes ten minutes. No central feature such as a church or school exists among the homes, and the stores are relatively new. They are also the only Ladino community located on the riverbank. Another major difference between Victoria and the other Ladino communities is that the majority of the residents do not own land. To plant crops, they borrow lands from one of the neighboring haciendas or from one of the large land owners across the river.[2] This appears to be a long established practice, with all of the Victoria residents speaking well of the large land owners.

[1] Congo, due to its small resident population, will not be included in this chapter.
[2] It was reported by residents that the two haciendas located on either side of Chiquerito and Victoria acquired their land from INA during periods of land redistribution in the 1960's.

Chiquerito, the neighboring mixed community, is similar in their lack of land and nucleated settlement. The major difference between Chiquerito and Victoria is that Chiquerito has two distinct groups of homes, one Miskito and one Ladino.

Agriculture

Solar in the Ladino communities refers specifically to dooryard gardens with plantings of flowers, herbs, and fruit trees; not the plot of land where the home is built, as in Miskito communities. The frequency of *solares* in the Ladino communities does not reveal any definitive patterns. Table 5.1 shows that *solares* are most common in Buenos Aires and Brans, with the fewest in Fuente de Jacob. The crops in the *solares* are the same as those planted by the Miskito communities. Livestock, however, is not solely located in the *solar*, as in Miskito communities. Smaller animals, such as chickens, will be kept near the home, where as larger animals, such as cattle, will be kept out in the pasture. In Ladino communities, the presence of one large contiguous parcel for each owner creates more effective conditions for freely roaming livestock.

Table 5.1: *Solares* in Ladino Communities

Community	Percent with *solares*
Victoria	63
Fuente de Jacob	42
Guapote	63
Buenos Aires	70
Brans	71

The Ladinos' subsistence crops are planted in a very similar fashion to the Miskito communities. They use the same techniques and plant by the same calendar. However, due to their location in the *cerro* the Ladinos have no riverine alluvial soils, and therefore must choose from a

narrower selection of soils. Some properties may have small streams, but annual flooding of the smaller streams is not a reliable source of soil nutrients. However, some of the larger land owners offset this disadvantage through their generous land holdings, which allow them to choose from a broad range of locations and conditions.

Ladinos plant the same staple crops as the Miskito, but put less emphasis on supplementary root crops such as potatoes, taro, and dasheen. Table 5.2 displays the percentage of farmers in each community who had planted the staple crops that year. These Ladino communities reflect the cropping percentages found in Banaka and Chiquerito, with the exception of the manioc. The lower percentage of people who plant manioc appears to reflect the personal preferences of the Ladinos. The higher percentages of people who do plant manioc in Brans and Guapote are due primarily to the higher frequency of pigs in the community. Manioc is often planted to feed the pigs.

Tables 5.2: Crops Planted by Ladino Farmers

Community	Beans	Rice	Corn	Manioc
Victoria	94%	88%	94%	56%
Fuente de Jacob	92%	92%	92%	58%
Guapote	91%	95%	91%	95%
Buenos Aires[3]	100%	66%	83%	66%
Brans	100%	100%	100%	90%

The technique used for weeding is similar to the Miskito communities in that the majority of Ladino farmers prefer to use herbicide when possible. As shown in Table 5.3, the prevalence of herbicide use is higher in most Ladino communities than in the Miskito communities. A possible

[3] Buenos Aires has a smallest population of the five villages listed.

reason for the lower usage in Brans is that they are a relatively new and isolated community with fewer opportunities to earn money to purchase the herbicide.

Table 5.3: Prevalence of Herbicide Use in Ladino Communities

Community	Percentage
Victoria	87
Fuente de Jacob	90
Guapote	90
Buenos Aires	100
Brans	71

In addition to similar preparation, planting, weeding, and calendars, the Ladinos also follow the fallowing system that is used by the Miskito. Table 5.4 displays the average amount of fallow time by community. It also incorporates the percentage of farmers who leave their fields in fallow for two years. This is included because the two-year fallow is the most commonly used among this group. Victoria is not included in this table because they do not own their own agricultural plots. None of these communities leave fields to fallow for as long as the Miskitos leave their fields to fallow. The older communities typically fallow longer than the younger communities, for example,

Table 5.4: Length of Fallows Among the Ladinos

Community	Avg. Length of Fallow (years)	Percent Using Two Year Fallow
Fuente de Jacob	3.1	25
Guapote	2.6	56
Brans	2.4	67
Buenos Aires	2	100

Fuente de Jacob has the longest fallow period, approaching that of the average Miskito. Shorter fallow times do not allow nutrients to regenerate as well as longer fallow times and are therefore more likely to lead to the exhaustion of the soils.

The amounts of land owned by the Ladinos varies by community.[4] Figure 5.1 shows the land holding in Brans, Guapote, and Fuente de Jacob. Buenos Aires is not included due to the small amount of data that was collected on land holdings in that community. Of the seven households in Buenos Aires, two use their father's land. In two other households, the men were not at home and the wives were not able to tell me the amount of land they own.[5] The three remaining households own 8 Mz, 25 Mz, and 60 Mz. After observing where the other two land owners lived, it appears that their land holdings would not exceed the largest holding of 60 Mz. This community, due to its age and location, appears to have similar land holdings to Brans. Brans and Buenos Aires are two of the youngest communities in the study area. It is confined by mountainous terrain and neighboring communities, which limits the amount of land farmers can claim. Guapote and Fuente

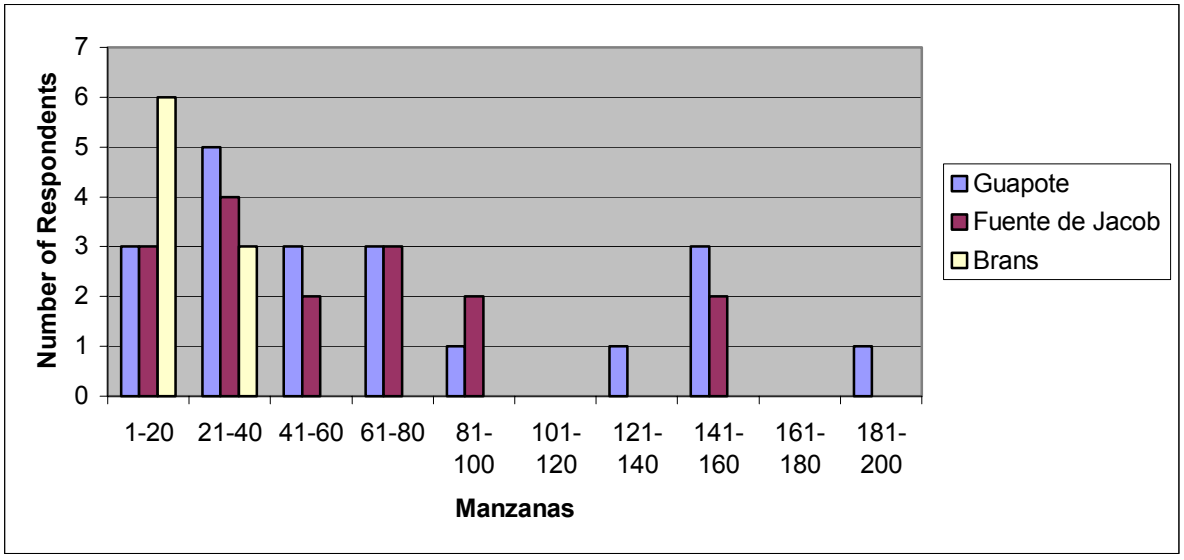


Figure 5.1: Land Holdings Among Ladino

[4] Land owners will often respond to questions about landownership by saying "I pay for x Mzs", meaning they pay taxes on a certain amount or bought a certain amount, but in reality use or claim more than that.
[5] Often, women will know but will not speak about it for fear that there husband swill get upset that they discussed it with an outsider.

de Jacob are older frontier communities that are not as constricted by topography and neighboring communities although settlement tends to meander along the areas lower in elevation, usually avoiding the steeper slopes. As a result, farmers own larger tracts of land. It should be noted that the oldest household in Guapote is not included in Figure 5.1 because, statistically, at 400 MZ, it is an outlier that would distort the table.

Protein Sources: Hunting, Fishing, and Livestock

Hunting and fishing are not major sources of protein in Ladino communities. Table 5.5 shows the percent of residents who hunt and fish in the Ladino communities, the frequency of these activities, and how often they eat some kind of protein, whether it be fish, chicken, pork, or beef. The proportion of residents who do hunt ranges from 10 percent to 52 percent, depending on the community. No clear pattern emerges, but some explanations can be made. Victoria does not have any direct access to forest, which would account for the low percentage who hunt. Buenos Aires is

Table 5.5: Hunting, Fishing, and Meat Consumption in Ladino Communities

Community	Percent who Hunt	Percent who Fish	Hunting Frequency	Fishing Frequency	Meat/Week
Victoria	24	47	bimonthly	bimonthly	1
Fuente de J.	44	11	bimonthly	monthly	2.6
Guapote	52	35	bimonthly	bimonthly	3.1
Brans	10	20	weekly	weekly	< 1
Buenos A.	29	43	bimonthly	bimonthly	< 1

located between several communities, decreasing the amounts of local habitats and animals. Guapote has the best access to forested lands, being on the edge of the frontier. The frequency of these trips, which are not guaranteed success, are usually bi-monthly.

The ability to fish depends on the proximity of the river and streams. Brans is one of the most isolated from water sources, whereas Victoria is on the river. The average frequency for fishing is also bimonthly. However, the percentage who hunt and fish and the frequency with which they do so does not seem to relate to the frequency with which they eat protein. Therefore, they must rely on other sources of meat, mainly livestock.

Ladino communities tend to own more swine and cattle than the Miskito communities. Table 5.6 lists the percentages of households in the Ladino communities that own pigs and cows. The majority of these percentages outweigh the percentage of Miskito who own livestock. However, swine ownership continues to be higher than cattle. Victoria, due to its lack of land, does not have cattle. Pigs are far more common, but all who own pigs have fewer than 10.

Table 5.6: Percent of Ladinos Who Own Livestock, by Community

Community	Percent Owning Cows	Percent Owning Pigs
Brans	60	80
Buenos Aires	57	43
Fuente de Jacob	56	67
Guapote	58	83
Victoria	5[6]	56

Figure 5.2 charts the number of swine among the portion of the population that owns them by community. It shows clearly that the newer communities, with less land, own fewer pigs than the older communities. For example, Buenos Aires does not have one household with more than five pigs and the majority of households in Brans also have fewer than five. The same pattern is repeated in figure 5.3, which depicts the numbers of cattle owned by owning households in each

[6] This statistic does not include the neighboring hacienda.

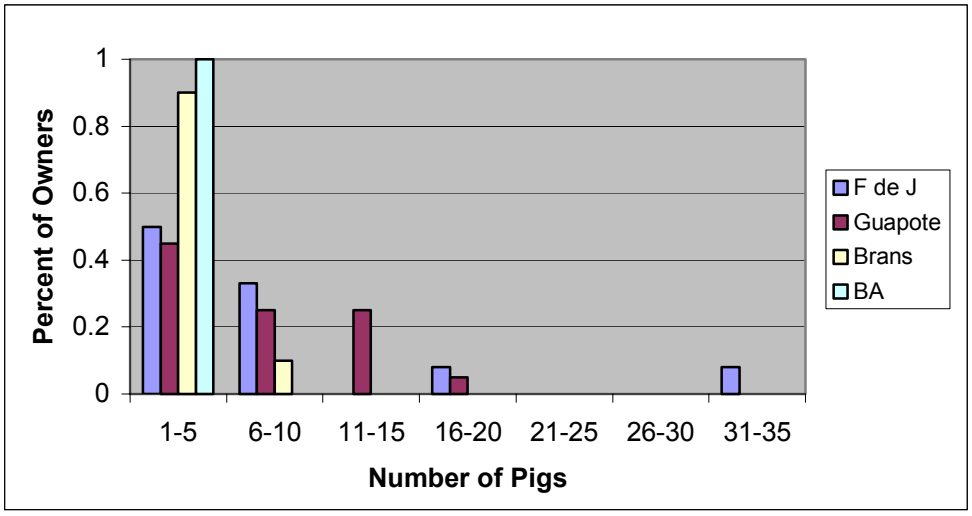


Figure 5.2: Swine in Ladino Communities

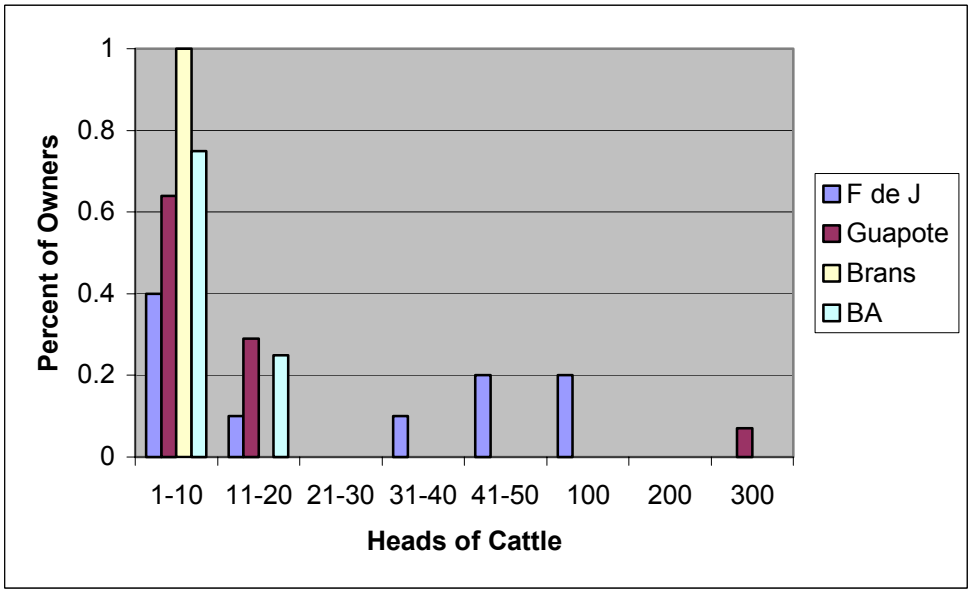


Figure 5.3: Heads of Cattle in Ladino Communities

community.[7] Guapote has one household above the 11-20 category, and that owner has approximately 400 cattle, whereas Fuente de Jacob has 50 percent of their cattle owners with more than 20 heads of cattle. Together, table 5.6 and figures 5.2 and 5.3 display that in both percentage of households that own animals and the number of animals owned, the Ladinos have more livestock than the Miskito. Table Figures 5.2 and 5.3 communicate that the majority of livestock owners own

[7] In figure 5.3, the categories on the x-axis are not continuous.

on a small to medium scale. However, there are exceptions. Earlier settlers own the largest tracts of land and had 20 plus years to acquire large herds, these owners and the wealth they hold in their livestock are exceptions to the norm.

Wage Labor

The Ladinos, like the Miskitos, have diversified in their strategies to earn cash. Table 5.7 demonstrates that agricultural labor is a common means of earning cash in both Victoria and Guapote, but plays a less significant role in the other communities. In Brans, Fuente de Jacob, and Guapote selling animals, animal products, and crops are popular means for earning cash. Brans, not having a lot of livestock, may not seem to support a high percentage of residents who sell animals and animal products. This activity among smaller land owners tends to reflect something that is done in case of emergency or when a lot of cash is needed for a special event. These farmers, not having as much opportunity to work for others, rely heavily on their animals to get them through times where cash is a necessity.

Table 5.7: Wage Labor in Ladino Communities

Activity	Victoria	Brans	B. Aires	Fuente	Guapote
Agricultural Labor	88%	30%	14%	31%	56%
Sell Animals/Products	6%	80%	14%	62%	56%
Sell Crops	12%	50%	29%	62%	12%
Rent Land				8%	8%
Mid-Man			43%		
Other	18%			15%	4%

Conclusions

Several differences exist between the Ladino and Miskito communities. Ladinos own larger tracts of land, which they claim by clearing. Therefore, they are permanently deforesting a greater quantity of land. Livestock ownership is more common among the Ladino and they tend to own greater numbers of swine and cattle. Through their extensive clearing they impact the resource base traditionally used by the Misikito. Less visible differences, such as shorter fallow periods and less crop diversity, will also impact the quality of the natural resources base. In the following chapter these differences will be placed in context with the information from the previous two chapters, which will allow assumptions to be made on land use and land cover change in the RPBR and what these changes mean for the future of Miskito culture, resource base, and the integrity of the RPBR.

CHAPTER SIX:

COMPARATIVE ANALYSIS AND LONG TERM OUTLOOK

Of the similarities and differences among these communities, some are more important to the future of both the residents in the study area and the RPBR. This chapter will review, compare, and, at times, further analyze these differences. The multiple impacts of the changing patterns will be examined in regards to the Miskito culture, the residents' future, and the RPBR.

Settlement patterns differ according to ethnicity and the age of the community. Victoria, the oldest Ladino community, has a nucleated settlement pattern similar to the Miskito settlement patterns, but without the dispersed agricultural land. Victoria's riverine location mimics the Miskito preference to settle along waterways. The remaining Ladino settlements tend to be inland, where the available land is, and are more dispersed in the settlement, with residences and land holdings found on one contiguous plot of land. These inland settlement tend to follow the areas of lower elevation, often along smaller streams and creeks. Understanding the spatial behavior of the changing settlement is useful in speculating on potential areas for future settlement.

Certain agricultural techniques are similar throughout the communities. They follow the same calendar, utilize comparable planting techniques, sow the same staple crops of beans and rice, and plant similar areas of land, as shown in Table 6.1.[1] With the exception of Victoria planting much less, and Fuente de Jacob planting more, the remaining six communities plant similar amounts per household.

[1] Congo is not included due to its small sample size (n=1) and because the resident has not yet established a cropping pattern.

Table 6.1: Average Area Planted by Households in Each Community

Community[2]	Rice Planted		Beans Planted		Total Area Planted	
	Mz	m^2	Mz	m^2	Mz	m^2
Fuente de Jacob (L)	2.4	21,936	.83	7586	3.25	29,705
Guapote (L)	.98	8957	.58	5301	1.6	13,710
Victoria (L)	.45	4113	.26	2376	.71	6489
Buenos Aires (L)	.84	7678	.53	4844	1.4	12,796
Brans (L)	.71	6489	.48	4387	1.2	10,968
Limonales (M)	1.1	10,054	.59	5393	1.7	14,624
Banaka (M)	.77	7938	.46	4204	1.2	10,968
Chiquerito (M)	.83	7586	.37	3382	1.2	10,968

One difference is the amount of time land is left to fallow. In the Miskito communities the average fallow time is 3.5 years, and in the Ladino communities, 2.5 years, with 2 year fallows being very common in Ladino communities. The shorter fallow reduces the amount of land needed for agriculture, but also may hasten the depletion of the resource base.

A second difference is the number of livestock that is owned by the households in Ladino and Miskito communities. The Ladino communities own more livestock, necessitating more land for pasture or crops for feed. However, the Ladinos do not conform to the popular image of frontier settlement consisting mainly of cattle ranchers, deforesting great expanses of land to create pasture. Most Ladinos want land to plant and have a few animals to provide supplementary income, protein, and insurance. A few large land owners are scattered throughout the study area; these large tracts combined with the Ladino settlement patterns create a landscape that looks as though there are more than a few extensive cattle ranchers. Out of the 60 interviews in the Frontier Communities, six farmers own between 11-20 heads of cattle and only four own more than 20. The same pattern is reflected in swine ownership; five households own between 11-20, with only one owning more than 20. Table 6.2 offers a comparison of cattle ownership in some Ladino communities and Miskito communities.

[2] M indicates Miskito communities and L indicates Ladino communities.

Table 6.2: Cattle Ownership: Ladino vs. Miskito

	11-20	21+
Guapote	4	1
Fuente de Jacob	1	3
Buenos Aires	1	
Limonales	1	5
Banaka	1	

It should be noted that of the five Limonales residents that own more than 20 cattle, three are Ladino settlers. Therefore, out of the 17 residents in the study area that own more than 10 heads of cattle, only 24% are Miskito.

A summary of the primary data on the amount of land residents own demonstrates two distinct characteristics of the study area. Table 6.3 lists the mean and median land sizes belonging to households in the study area by community. It is very clear that the Miskito residents in Banaka and Limonales own significantly less land than their Ladino counterparts. In comparing Limonales and Banaka, two trends are important. The median land sizes are similar, but the means that

Table 6.3: Amount of Property Owned in Manzanas, Summarized by Community[3]

Community	**Mean**	**Median**
Banaka	18.5	9
Limonales	38.6	9.5
Brans	19.4	20
Buenos Aires	31	25
Fuente de Jacob	61.9	50
Guapote	92.8	70

Limonales has a much larger range in land size than Banaka. This large range reflects both the larger landholding of long-term residents and a significant number of residents without land, which is due to the pressure of growing population densities. Banaka lacks both these outliers in terms of large landholdings and the cohort of landless residents.

[3] Chiquerito and Victoria were left out of this table due to the minimal amount of land that owned in these communities. Congo was left out due to the small population of one household.

Ladino residents clearly have more land than the Miskito. This is demonstrated by both the mean and median land sizes in Table 6.3 and the percent of residents who have landholdings of less than 10 Mz in Table 6.4. In analyzing the data on Ladino settlement it is clear that, in their spheres, longer established residents tend to have larger tracts of land. This is due to two reasons, when they settled there was more land available and they have had more time to acquire land by both clearing it to claim it and purchasing it.

Table 6.4: Percent of Residents with Fewer than 10 Mz, by Community

Community	Percent with <10 Mz
Brans	22
Guapote	15
Fuente	0
Banaka	54
Limonales	50

Further analysis of the sizes of land holdings revealed that land sizes were greatly over-exaggerated. To determine whether or not the data were at all reliable, the reported and measured plot sizes were analyzed with correlation and regression formulas. The results demonstrated that although smaller plots are often underestimated and larger plots are often overestimated, there remains a strong correlation, +.947, between the measured plot sizes and reported sizes. The findings were similar to those found by Dodds (1994) while doing studies in a coastal Miskito community. The regression formula, provided in Appendix A, is appropriate for correcting data on plot sizes, but would be not be a valid technique for correcting the much larger and unmeasured pieces of land owned by the residents in the study area. Throughout this document, reported sizes were left uncorrected in favor of reporting primary data.

Changes in Miskito Culture and Land Use

Land-use change among the Miskito is mainly due to both the increasing population and the escalated deforestation rates that results from Ladino settlement. The growth in population, which

result from both natural increase and migration, increase pressure on the natural resource base, thus creating land shortages. The main observable effects of population growth are the decreasing fallow periods and the appearance of people without land in Limonales, most whom are both new heads of households and some of the poorest households in the community. Ladino settlement and the accompanying deforestation exacerbates this problem of a land shortage. The Miskito have been compressed into a smaller area of land than they traditionally used while their population has increased. Another significant impact of the loss of forest is the decreasing reliance on hunting to provide protein. When asked about hunting practices, both today and 20-30 years ago, many Limonales residents reported that *tigres* and other animals, used to come into the village, but now they are impossible to find. The scarcity of these animals was evidenced by two big news items in Limonales in March of 2001, the only times large animals were found between October 2000 and May 2001.[4] First, someone found an *oso caballo*, a giant anteater. It was such a rare site that they brought it to the schoolyard so everyone could observe it. Secondly, someone caught a *danto*, or tapir, off in the forest and killed it. Several residents went to see it, but by the time the residents completed the extensive hike, a few hours, the tapir was skinned and dismembered, ready for sale (L14, L23, L29).

Now, as opposed to 20 years ago, protein is not available and some Miskito are landless; they are forced to depend on the cash economy to meet their basic needs. Employment opportunities are provided by the Ladino population, enabling the Miskito to earn the cash to meet their basic needs. However, the time spent in cash earning activities decreases the time they spend in other activities that would encourage *pana-pana*, the ethic of generosity, which manifests itself in a network of support from friends and family when there is a need. As this sharing of labor and goods decreases one is again forced to buy, necessitating the use of cash to replace what is no

[4] Unfortunately, both of these events occurred while I was in the United States. I returned shortly after, in late March, while the people were still talking about both of these events.

longer divided among friends and family. Although the Miskito have not sacrificed their subsistence practices to cash-earning activities, their participation in these activities propagates the clearing of more forested areas, leading to decreased availability of natural resources and again increasing dependence on purchased items to replace what was previously supplied by the natural environment. This process creates a cycle where once they begin to participate in wage-earning labor that alters environment, they become increasingly reliant on securing cash employment in order to meet their basic needs, which often entails destroying more of the natural resource base and cultural ties they depend on, thus increasing their dependence on wage-earning employment. When examining this process from a larger scale, one can see that this is actually is the diffusion of the cycle of poverty; the same cycle that drives frontier settlement is being recreated in their new home.

Increasing connectedness with the outside world, particularly with more developed countries, is raising the Miskitos' awareness of the quality of life in other societies. As they see the quantity of material goods that characterize our global culture, they too desire a more materialistic lifestyle. Before yesterday's desires for goods such as radios and watches are met, they are coupled with greater desires. Professionals or the wealthier residents in the communities may have propane to fuel refrigerators and cooktops, some divers invest in chainsaws. One cattle rancher even has a solar panel to power his CB radio and car batteries to provide light in the evenings.

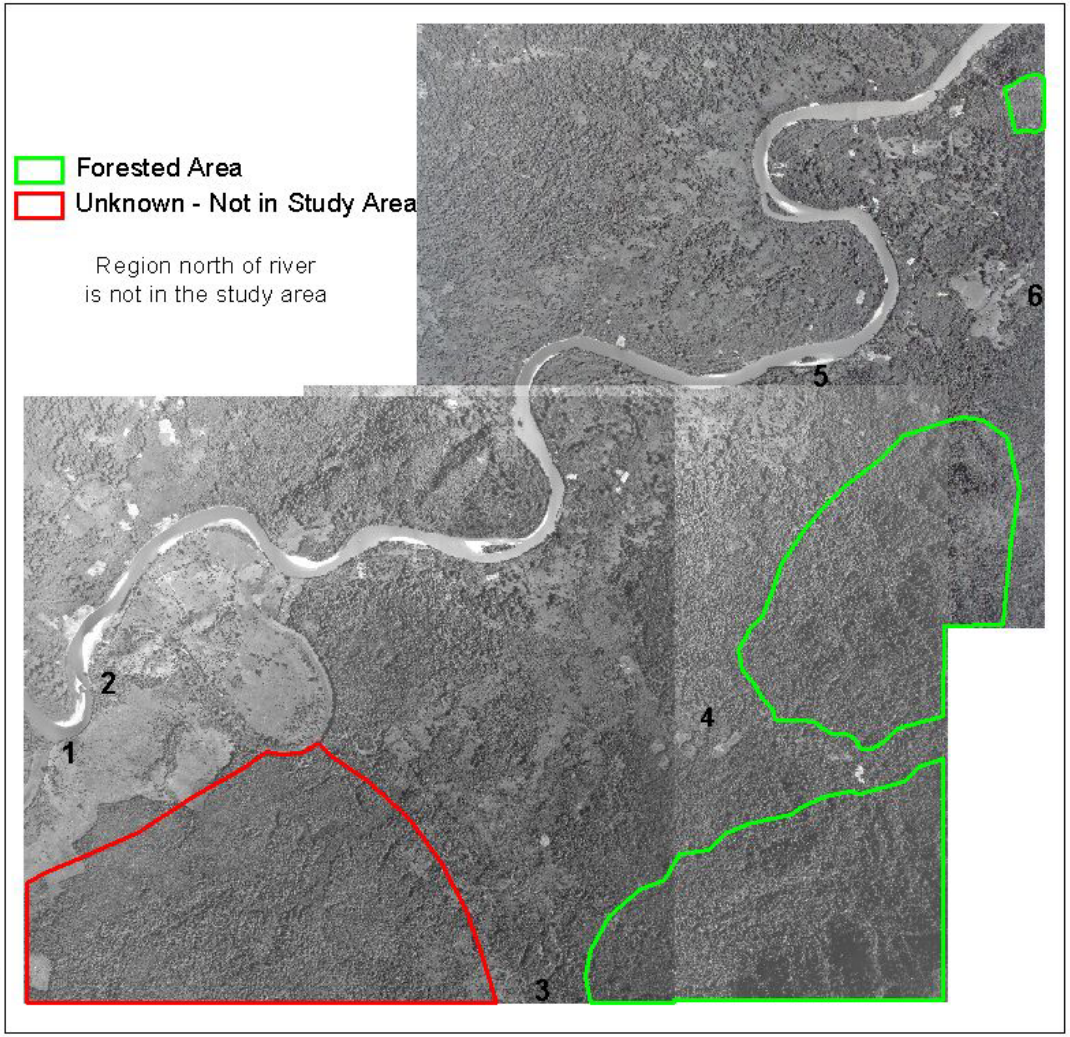
During the field work the people talked of an Argentinean engineer who was offering to coordinate a large development operation based on investments that would be made by the second richest man in the world. Many residents in the study area believed an incredible economic opportunity was coming, one that would develop their land, export natural resources and agricultural products, and make them wealthy. However, to participate in and profit from this operation each family needed to pay an enrollment fee of 100 Lempira, which was equivalent to two days labor or approximately $6. Many residents invested in this dream; they envisioned a future with cars and five story buildings, and how wonderful it would be. The enthusiastic conversations

generated by thoughts of prosperity and economic development outshined any discussions or comments about the importance of the forest and its maintenance. Employment and economic development that would result in lifestyles similar to those in developed nations was clearly their first choice.

Spatial Extent of Land Use: Past, Present, and Future

Changes in land use and land cover can best be examined through aerial photos. Ideally, complete coverage would be available of the study area from two different points of time during the last 20 years. What is available are images of part of the study area from 1982 and 1997. Map 6.1 is a composite of three images from 1982. The majority of the area displayed south of the river lies within the study area, the only major exception being the portion enclosed by the red polygon. Communities that are within this composite view are Limonales, Victoria, Chiquerito, and Buenos Aires, as well of portions of Fuente de Jacob and Guapote (refer to map 3.4). The areas within the green polygons are those that remain relatively unutilized and therefore remain forested. The area just off the composite adjacent to the green polygons was delimited and settlement has been prohibited within that area because it contains the source of water for Limonales. The remaining area in the composite is currently being used by approximately 99 of the 177 households within the study area. Only approximately 22 of these 99 households were present when the image was taken. Map 6.2 is a composite of two images taken in 1997. Less of the study area is visible in this view: Chiquerito and Victoria are completely visible along with the southern fringe of Limonales and the northern extension of Guapote. Paradoxically, more forest now surrounds the outskirts of Victoria and Chiquerito. The owner of that piece of land died in the mid to late 1980s and the land passed to the son who has not been using it as intensively as the father. The rest of the land is clearly being used more intensively than in the 1982 composite.

Map 6.1: Land Cover, 1982



Villages
1 = Chiquerito
2 = Victoria
3 = Guapote
4 = Brans
5 = Limonales
6 = Fuente de Jacob

Source: Instituto Nacional de Geografia
Photos taken: 1982
Flight line and photo numbers: Line 50, photo 163, Line 51 photos 151-152

Map 6.2: Land Cover/Land Use, 1997

Source: Instituto Nacional
de Geografia
Photos taken: 1997
Flight line and photo numbers: Line 3, photos 61 and 63

Population change can also be used as a basis for speculating about the extent of land use change. Table 6.5 shows the change in population between the Honduran census of 1988 and the population found during fieldwork. This increase in population, an increase of

Table 6.5: Population Change Between 1988 and 2001.

Community	1988	2001
Limonales	167	302
Banaka	0	204
Guapote	21[5]	134
Victoria	13	99
Fuente de Jacob	8[5]	69
Chiquerito	37[5]	49
Brans	NA	47
Buenos Aires	NA	42
Congo	NA	4
Totals	246	950

approximately 385 percent in 13 years, is drastic. Over the past 20 years very little has been done to discourage the migration into the RPBR and enforce current land use guidelines. So in discussing the future of land use in the study area, it will be assumed that these two aspects will not change. Assuming a constant rate of increase, one would expect to see approximately 3658 people in 2014. Because only a fraction of land in the RPBR is impacted by migration, these results can not be generalized to the RPBR as a whole. However, it is certain that the frontier will advance into new territory and natural population increases will continue to occur in the remainder of the biosphere.

These growing numbers solicit speculation on how much land will the additional 2708 people will need. Using the numbers for the median amount of land planted per household (1.3 Mz

[5] These communities were not in the 1988 census. The numbers in Table 6.5 are approximations based on survey responses regarding time in residence.

or 11,882 m^2) and the average household size of five people per household the amount of land necessary solely to provide the most basic food needs of the people can be estimated. The 542 additional households that would be present in 2014 would need an additional 705 Mz, equivalent to 6,440,044 m^2 or 6,440 km^2, which corrected by the regression formula would equal 3,384 km^2, an area equal to 42% of the RPBR. The total population's agricultural land use would equal approximately 950 Mz, equivalent to 8,685,742 m^2 or 8686 km^2, which corrected by the regression formula would equal 4372 km^2, an area equivalent to more than half of the area of the biosphere. These statistics are not meant to be a prediction, but to give an idea of the rapidity with which population and land cover is changing and what could happen in the future. However, it should also be noted that these figures represent area planted, not the amount of area that would be necessary to maintain the current fallow periods and soil fertility. To maintain soil fertility, a much larger area would be required to allow for plot rotations and sufficient fallow times. Therefore, according to current fallow times, a sustainable land use system would require a three to five times the land area cited above.

Implications for the Río Plátano Biosphere Reserve

Several actors are influencing the future of the RPBR. Within the international community various actors look to influence both economic activities and environmental conservation within Honduras. Economic growth is encouraged through policies and aid packages, often emphasizing agricultural exports and the privatization of state agencies, which sacrifice the small farmer, some of whom migrate eastward looking for new opportunities. In addition, global demand for products such as valuable hardwoods and lobster also influence economic activities within the RPBR, often undermining any ongoing efforts at ecological and cultural maintenance.

International organizations continue to actively support and invest in the idea of a protected area, whose human and physical attributes are deemed scarce and disappearing. Non-governmental organizations such as World Neighbors and The Nature Conservancy who believe avidly in the

protection of this area, attempt to fill the void left by empty rhetoric and unexecuted management plans. The conservational message of the financers of the RPBR and various NGO's does trickle down to individual communities, but offers only a viewpoint that can not be reconciled with the local reality.

The national government agrees that both economic growth and environmental conservation should be a priority, but the unfulfilled basic needs of many Hondurans demand that the government channel its few resources to its own economic development. The local sentiments echo those of the national sentiments; although the environment is appreciated, improving one's economic well-being is the priority. The residents of the RPBR will continue to use the available resources to improve their socio-economic situation. They will continue adapting their land use practices not only to ensure their survival, but to reach for a higher socio-economic status, as any other person would do when faced with such "undeveloped" conditions, even if that implies losing what has for so long been an integral part of their culture.

An asymmetrical tug of war exists; the ideals of conservation and cultural survival versus the necessity of meeting basic meets. The dominating forces include the global economy, with its ramifications reverberating down to the local level, and the aspirations of the local population to survive, and possibly attain a socio-economic status that is more in alignment with the popular global culture. At the local level, this victory sacrifices the environmental integrity of the biosphere. A very important question needs to be asked by those working with the RPBR; as long as the residents of both the biosphere and the surrounding region feel as though they do not have enough, whether it be in regards to basic needs or supplementary material goods, and they continue to depend on the natural resources to meet those needs, will it be possible to have more than a paper park?

Implications for Future Research

Local cultural ecological studies, embedded within a broader political ecological context, are a valuable tool for understanding land use and land cover change, especially within protected areas. A cultural ecological approach ensures a detailed examination of the local level, which is integral for understanding not just how people are altering their interactions with the environment, but why. In order to better understand the multiplicity of factors that contribute to the why, it is pertinent to place the local events within a broader political ecological context. This coupling of cultural ecological methodology set within a political ecology conceptual framework facilitates both a bottom-up and top-down comprehension of the issues. Studies utilizing this dual approach are also sorely needed in "frontier zones". These areas are often ecologically valuable and/or vulnerable areas and, unfortunately, an insufficient amount of research exists on these regions of drastic cultural and environmental change.

An honest re-evaluation of what protected areas should realistically be expected to accomplish and whether inhabited protected areas are a viable option needs to be coordinated. In addition, unbiased assessments of policies and management approaches must be a research priority. These studies ought to embark on the delicate discussion regarding how much underdeveloped countries can be expected to contribute, whether it be logistical or financial, while at the same time ensuring that they have ownership of what is occurring within their own boundaries.

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APPENDIX A:

SURVEY

Date: Location:

Duration: Residence:

Nombre	edad	salio	relation

2. Ud es Miskito o Ladino? Esposo/a?

3. Donde nacio?

Y su esposa/o?

4. En cuales partes viven otra familia?

5. Tiene hijos que viven o trabajan en otras partes?

M/F:

Edad:

Donde:

Trabajo:

Por que salio:

6. Tiene otra casa?

Donde?

Cuanto tiempo pasa alla cada ano?

7. Hace cuanto tiempo que vive aqui?

Donde vivo antes?

Por que salio?

Por que vino aqui?

8. Tiene solare?

Que plantas tiene?

9. Sus padres tenian un solare?

10. Que animals tiene? Numero? Comer o Vender? (leche, huevos, carne?)

11. Cuantos propiedades tiene?

tamano:

compro/descombro/de familia?

Cultivos:

12. Como prepara la tierra?

Cuando

13.

Cultivos				
Tamano				
Semillas de				
Cuan. siembra				
Cuan. limpia				
Como limpia				
Cuan. cosecha				
Production				

14. Quien ayuda a ud?

15. Usa chemiquas?

Cuales? Con:

16. Deja la tierra descansar? Cuantos anos?

17. Va a comprara o descombrar mas tierra?

18. Ha visto cambios en produccion?

19. Va a montear? Cada cuanto? Con perro o rifle?

20. Pesca? Cada cuanto? Con cordel o red?

21. Cada cuanto come carne?

22. Cuantos palos de lena quema por desayuno?

23. Que hace para ganar dinero? Que gana?

Agricultura, Transporte, Madera, Vende carne,
Commerciante, Langosta, Vende pan, Lava ropa, Otra

24. Hace cuantos anos que trabaja asi?

25. Cuando trabaja, siembra menos?

26. Sus hijos que viven aqui- tiene su propio tierra o se usa la tierra suyo?

27. El huracan Mitch cambia producion?

28. Tiene:

agua potable	struc
bano	nivels
radio	piso
other (chsw, stove, ect)	roof
	cuartos

29. Trabaja con alguna organizacion? (ejemplo- iglesia, patronato, MOPAWI)

30.Cada cuanto sale por otros pueblos?

31. Cada cuanto sale de Gracias a Dios?

32. Que cambios ha visto aqui?

APPENDIX B:

EXAMPLES OF LIFE HISTORY TOPICS AND QUESTIONS

Agriculture

What crops did your parents plant?

What animals did they have?

What were the animals used for?

How has *pana-pana* changed?

Socio-economic

Did your family sell any crops?

What products were bought?

Where did you buy them?

How did your family make money?

Time Line

When was the first time you remember seeing a ….

motor, store, radio, chainsaw

When was the first time you drank coffee? Ate spaghetti? Cooked with lard?

APPENDIX C:

PLOT SKETCH AND MEASUREMENTS

The comparison of the plot measurements and reported sizes were inaccurate by varying degrees. The tendency to underestimate the areas of the smaller plots and overestimate the areas of the larger plots was consistent with Dodd's findings (1997). Pearsons correlation and regression were performed on the measured versus reported plot sizes to correct the reported statistics. In the interest of reporting primary data, the statistics throughout the majority of the dissertation reflect the reported areas. Only in the sixth chapter were the corrected numbers used (this is noted in the text) to create more accurate predictions for the long term implication of land use and land cover change. Below is the measurement units used by the residents, the reported and measured sizes of 11 plots, the results of the statistical analysis, and a sample plot sketch.

Units of Land Measurement in the Study Area and their Equivalent.

Term	Measurement	Metric Equivalent
Manzana (Mz)	100 yd x 100yd	9140 m^2
tarea	50 yd x 50 yd	2734 m^2
tarea de 25	25 yd x 25 yd	571 m^2
tarea de 12	12 yd x 12 yd	132 m^2

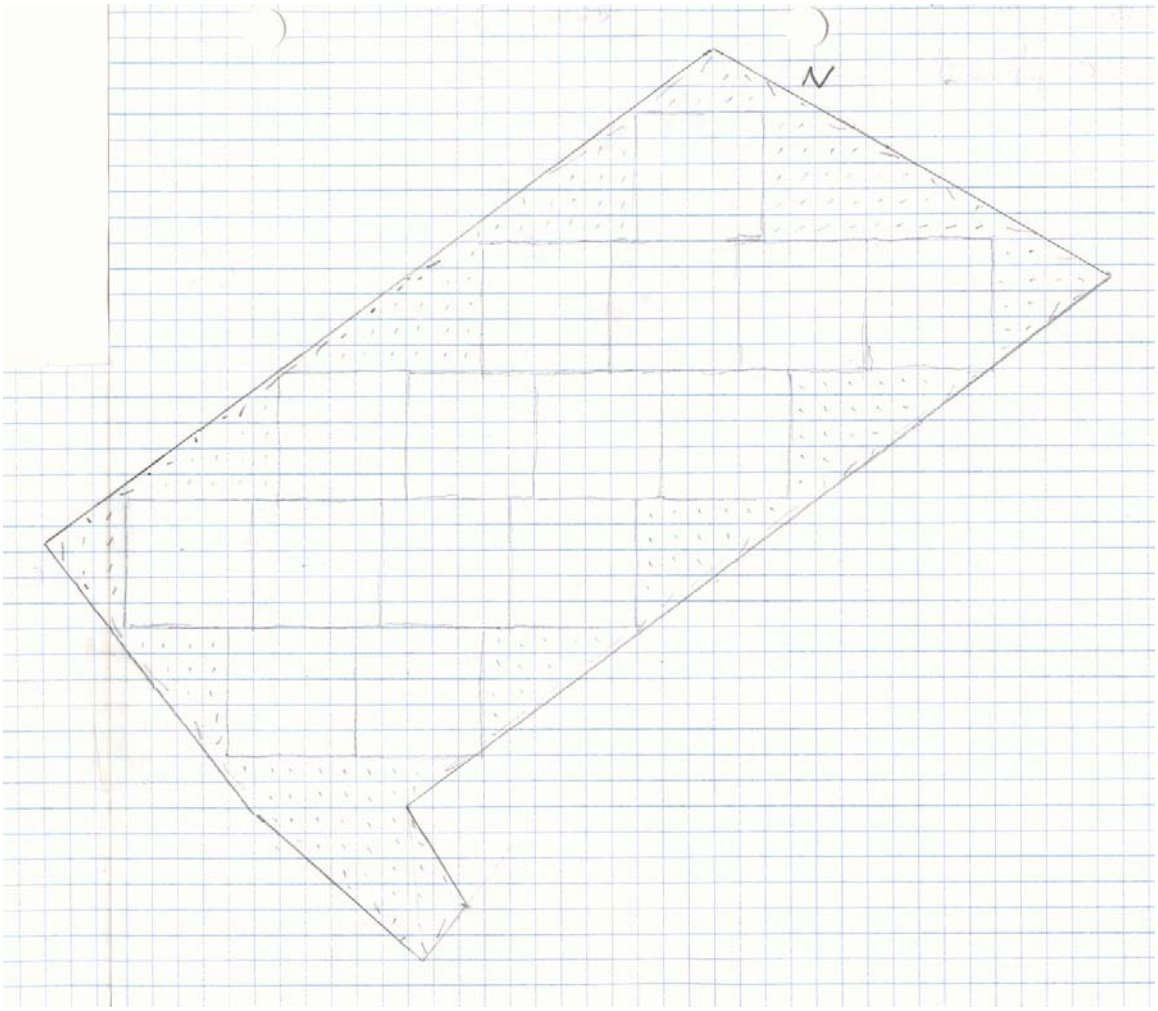
Reported Area and Measured Area of 11 Active Agricultural Plots.

Field	Reported Size	Metric Equivalent	Measured Size
BM-D#1	3 tareas de doce	395 m^2	418 m^2
BM-D#2	4 tareas de doce	526 m^2	611 m^2
BM-D#3	cuarto de Mz	2285 m^2	2351 m^2
BM-J#1	3 tareas de doce	395 m^2	446 m^2
BM-J#2	cuarto de Mz	2285 m^2	1243 m^2
L-DA#1	1 Mz	9140 m^2	4512 m^2
L-DA#2	1 Mz	9140 m^2	3481 m^2
L-Ps#1	1 Mz	9140 m^2	4643 m^2
L-DU#1	1 tarea de 25	571 m^2	490 m^2
L-DU#2	¾ Mz	6855 m^2	4533 m^2
L-DAb#1	Media de ¾ Mz	3428 m^2	2245 m^2

Pearson's correlation coefficient equaled +.947, which signifies a strong positive relationship between the measured and reported sizes. The regression formula that can be used to correct the

reported data is Y= 550 + .44(x). This formula would not be appropriate to correct land holdings. The holdings were not measured, just the parcels under cultivation, therefore correcting the data with the above regression formula would lead to invalid results.

Sketch of Sample Plot: L-DAb#1



VITA

Elizabeth Ann Fraser, daughter of Ann and Richard Fraser, was born on October twenty-first 1973 in Mineola, New York. She was raised in Merrick, New York, with her two younger brothers, John and Stephen. She attended the State University of New York at Geneseo from 1991-1995, where she earned a bachelor's degree in geography. It was during these four years that she discovered geography and took her first trip to Honduras. While at Geneseo her advisor, Dr. Brian Coffey, consistently encouraged her desires to conduct research in underdeveloped countries and to pursue her doctorate. In the spring of 1995 she was awarded a Fulbright to investigate women's roles and responsibilities and how they were changing, if at all, in response to gender-oriented development projects in Honduras. This research introduced her to both fieldwork and the Moskitia.

From 1996-1998 she attended George Washington University, earning a master's degree in geography. Her fieldwork took her to the department of Intibucá in western Honduras, where she conducted a comparative study of two agricultural development projects coordinated by a non-governmental organization, Christian Commission for Development. Dr. Marie Price, her advisor, was a great influence through her seminars in development and Latin America and offered invaluable support throughout the writing of her thesis.

After receiving her master's degree, Elizabeth received a Regents Fellowship from Louisiana State University, where she enrolled as a doctoral student in the Department of Geography and Anthropology. From 1998-2003 she worked with two advisors, Dr. William V. Davidson and Dr. Miles Richardson. Both Dr. Davidson's insights on Honduras and Dr. Richardson's perspective on culture were indispensable in her research. During this time she traveled four times to Honduras, where she spent a total of 11 months.

Currently, Elizabeth is working as an assistant professor in the Department of Geography at the State University of New York in Cortland.